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ABSTRACT

This document presents agriculture skill standards for programs to prepare Washington students for employment in the following occupations: John Deere agricultural equipment technician; agricultural and diesel equipment mechanic; irrigation technologist; turf management technician; and turf equipment service technician. The introduction explains the origins of skill standards and their benefits to various stakeholders, discusses the relationship between skill standards and the pyramid of competencies, details a model for continuous improvement and a process for building skill standards, and presents an overview of the Agriculture Skills Standards Project during which the skill standards were developed. The remaining four sections, which are devoted to the individual occupations, each contain the following items: (1) a historic DACUM (Developing a Curriculum) process chart for the occupation; (2) a template summarizing critical work function and key activities; (3) a template detailing the performance indicators, technical knowledge, and employability skills required for the occupation's key activities; (4) routine, crisis, and long-term planning scenarios typically encountered by workers in the given occupation; (5) the results of the validation survey conducted for the occupation; and (6) the results of the Secretary's Commission on Achieving Necessary Skills survey conducted for the occupation. The appendix lists 45 workforce, skills-standards and competency-based, and Internet resources. (MN)

1

ED 472 374

Washington State Board for
Community & Technical Colleges
Skill Standards Project

Skill Standards for
Agriculture

John Deere Agricultural Equipment Technician,
Agricultural & Diesel Equipment Mechanic
Irrigation Technologist
Turf Management Technician
Turf Equipment Service Technician

Prepared by:
Agriculture Skill Standards Consortium
With project management provided by
Walla Walla Community College,
Walla Walla, Washington

Washington State Board for
Community & Technical Colleges
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Skill Standards for

Agriculture

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Agricultural & Diesel Equipment Mechanic

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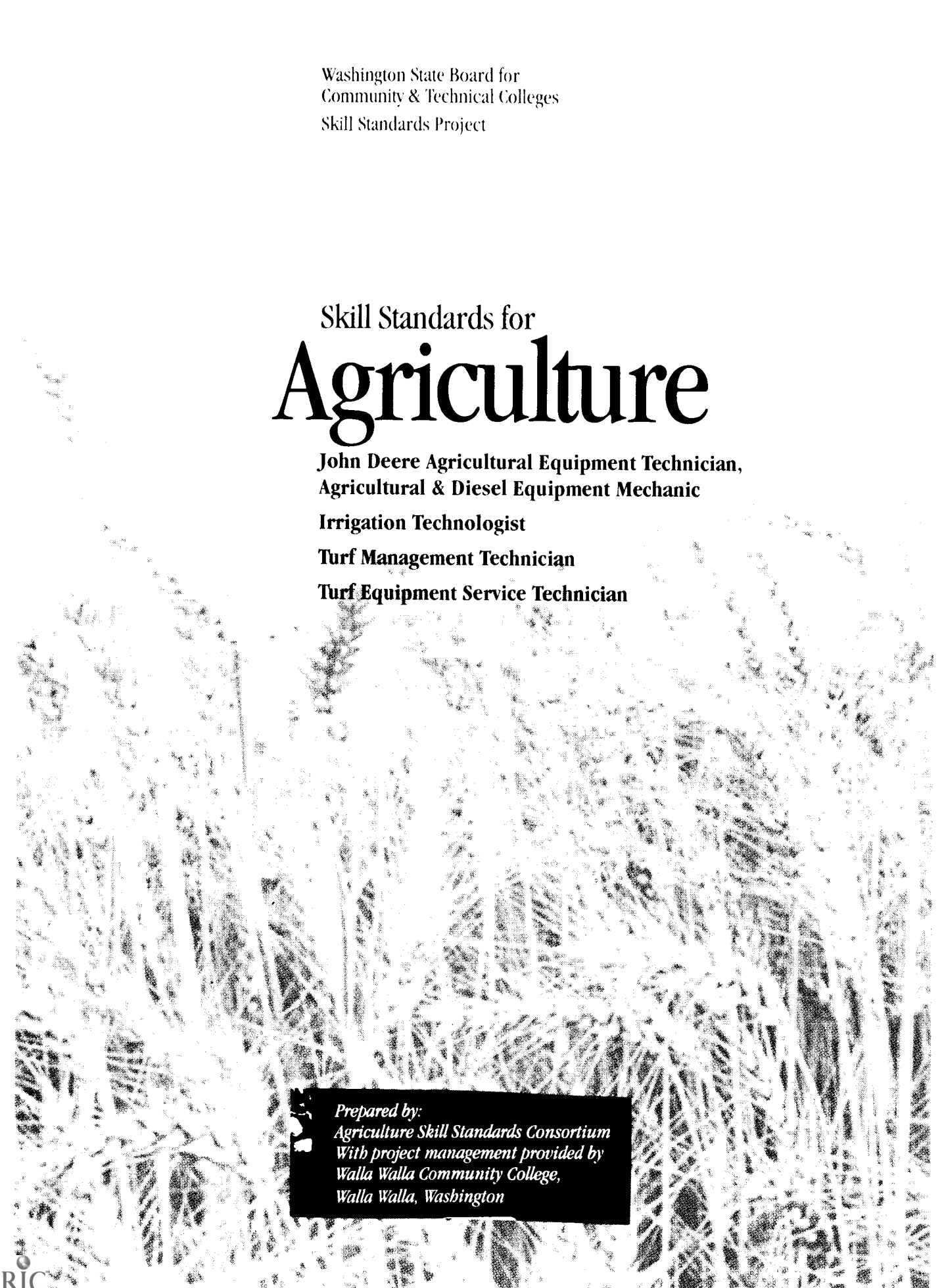

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FOREWORD

The Agriculture Skill Standards Project is part of federal, state, and local efforts to define the roles, responsibilities and training requirements for certain categories of agricultural professionals in Washington. These collaborative efforts will result in a significant contribution to the professional development of certain agricultural professionals and to the quality of instructional services.

The Steering Committee believes several groups will benefit from the establishment of these Skill Standards.

- Agricultural employees who can use the standards to identify the Knowledge, Skills, and Abilities (KSA's) they already possess and the KSA's where they may need additional education and training.
- Anyone who is interested in pursuing a career in agriculture can benefit by reviewing the Skill Standards as a preview of what is required of professionals in certain occupational categories.
- Organizations that provide education and training to agricultural workers may also benefit. This group includes, but is not limited to community colleges, technical colleges, state agencies, labor unions, employee associations, community-based programs, educational service districts, staff development professionals, four-year colleges, graduate schools, other government units, legislators, and other groups creating and/or evaluating curricula.
- School districts can benefit by understanding that Skill Standards provide a benchmark for determining the KSA's needed by staff serving in certain agricultural functions.

In conclusion, the Skill Standards may be used to:

- Generate interest in the field of agriculture as a career choice.
- Provide information to college faculty to prepare students for successful performance in schools and on the job.
- Assist high school teachers and counselors to better advise students preparing for careers in certain agricultural occupations.

By using the information provided in this document, the reader may gain an interest in agriculture and an understanding of careers available in agriculture.

TABLE OF CONTENTS

INTRODUCTION

The economy is facing a dramatic increase in demand for services by highly skilled technicians. Agricultural technicians entering today's workforce are asked to master more complex and sophisticated workplace skills, thus, creating a need for the upgrading of existing curriculum and training material.

The goal of the Agriculture Skill Standards Project is to specify the critical work functions, key activities, performance indicators and knowledge, skills, and abilities an individual needs to succeed in certain agricultural occupations. The result of this project will support the development of new curriculum and the strengthening of existing curriculum in programs leading to certain careers in agriculture.

The Agriculture Skill Standards partners anticipate that by developing skill standards in agriculture they will help generate interest in the field of agriculture as a career choice. In addition, these skill standards will help provide the necessary information to college instructors and professors to prepare students for successful performance in both the school and workplace settings. They will also assist high school teachers and counselors to better advise high school students preparing for careers in agriculture.

What Agriculture Occupations are Involved?

For this Skill Standard project, five occupational categories are studied. They are:

- John Deere Agricultural Equipment Technician
- Agricultural and Diesel Equipment Mechanic
- Irrigation Technologist
- Turf Management Technician
- Turf Equipment Service Technician

The Agriculture Skill Standards Project is part of continuing federal, state, and local efforts to better define the roles, responsibilities and training requirements in certain occupations. It is hoped that these collaborative efforts will result in knowledge that will make a significant contribution to the professional development of agricultural technicians.

What are Skill Standards?

Skill standards are performance specifications that identify the knowledge, skills, and abilities an individual needs to succeed in the workplace. Skill Standards are critical to improving workforce skills, raising living standards, and improving the competitiveness of the U. S. economy.

Skill standards answer two critical questions:

1. What do workers need to know and be able to do to succeed in today's workplace?
2. How do we know when workers are performing well?

Skill standards provide a common language to enhance communication on workforce development between business, labor, education, and the community. National recognition of skill standards in career fields provides a common basis for certifying achievement against those standards, thereby allowing for the portability of skills across geographic areas, companies, and careers.

Skill Standards may be used by several groups.

- Employers can use skill standards to maximize efficiency in recruiting, hiring, training, and promoting employees.
- Labor organizations can use the standards to ensure that workers have a greater voice at the workplace and benefit from enhanced career opportunities.
- Government can use skill standards to link other education reform initiatives, workforce training, and economic development by supporting collaborative efforts among education, business, and labor.
- Workers can use the standards to advance their own careers and enhance their ability to reenter the workforce.
- Students and job seekers can use the standards to understand and acquire the skills needed to attain high wage jobs and successful careers.
- Educators and trainers can use the standards to teach their students which will enable them to successfully transition into the world of work.

Where Do Skill Standards Come From?

The increased competitiveness of the global economy and the declining power of the U.S. economy have prompted government, employers, labor, and education leaders in the U. S. to reevaluate existing approaches and to develop new strategies for workforce development.

One of these responses was the "Goals 2000: Educate America Act" signed by President Clinton in March 1994, which established the National Skill Standards Board (NSSB) to encourage the development of a national system of voluntary skill standards for various occupations. Another was the "School-to-Work Opportunities Act of 1994" which encourages states to develop skill standards and link them to national efforts.

Why Are Skill Standards Important?

It would appear that in today's work places the only constant is change. Jobs that once dealt with relatively simple equipment in a highly structured workplace now deal with highly complex equipment in fluid environments. Today's seemingly parallel jobs now require high performance work processes and enhanced skills. Because skill standards reflect changing workplace realities, skill standards become a tool which can be used by applicants and employees to access greater career opportunities.

National recognition of skill standards in career fields provides a common basis for certifying achievement against those standards, thereby allowing for the portability of skills across geographic areas, companies, and careers.

Updating skills and knowledge must now become a lifelong endeavor, causing many employers and employees to spend more effort, time, and money on education and training. Skill standards provide benchmarks for making education and training decisions, shaping curricula, and directing funds toward highest value education and training investments.

Who Benefits From Skill Standards?

Skill Standards benefit all the stakeholders including employers, labor, education, government, and the community at large.

Skill Standards Enable Employers To:

- Align personnel qualification requirements with nationally adopted certificates of competence.
- Modify employee training.
- Simplify measurement of employee training effectiveness.
- Assess employee skill levels based on industry standards.
- Match employee skills to the work requirements.
- More easily document employee skills, training needs, and performance indicators.
- Improve customer satisfaction and confidence through better-developed evaluation skills of consumer contact personnel.
- Improve employee satisfaction and morale by clarifying expectations.
- Improve quality, productivity, time to market, and competitiveness.
- Achieve business goals.
- Partner with education and labor in developing school-to-work initiatives.

Skill Standards Enable Labor Organizations To:

- Improve member value to the employer.
- Provide a greater worker voice in the employment relationship.
- Link skill standards to increased training and upward career mobility for members of labor organizations.
- Assist employers to match employee skills to the work requirements.
- Develop skill-based training and certification initiatives that complement labor organization sponsored training programs.
- Communicate effectively with employers about worker training and retraining needs.
- Communicate effectively with employers and employees on workforce training policy.

Skill Standards Enable Educators To:

- Partner with employers and labor organizations in developing educational reform initiatives.
- Provide effective, targeted instruction.
- Develop benchmarks for certificates of competency earned by students.
- Communicate what employers expect of employees.
- Develop new program curriculum and evaluate existing curriculum based on industry needs.
- Develop common language on workforce preparation with business and labor.
- Improve relationships with local employers and labor organizations.
- Provide students with relevant career education and counseling.
- Communicate effectively about education reform to parents, family members, and legislators through connecting the skills to curriculum.

Skill Standards Enable Students and Employees To:

- Obtain certification of competency of the skills they gain through experience, education, or self-study.
- Enter and reenter the workforce with better options, including high skilled and higher paying jobs.

- Assess accurately employer expectations of the skills needed for positions and careers of their choice.
- Improve mobility and portability of employee credentials.
- Improve employee options in employment security and job opportunities for higher pay.
- Enhance employee performance and achievement by self-evaluation against known standards.
- Be pro-active contributors to the functions that make their school district employers more successful.

Skill Standards Enable Government To:

- Assist in the development of the highly skilled, high quality, competitive workforce that is a critical factor in remaining competitive in an ever-changing world economy.
- Evaluate the effectiveness of publicly funded education.
- Increase opportunities for under-represented populations by making public the information that defines the skills required for success and by facilitating the national adoption of those definitions and their use.
- Support the development of high performance organizations.
- Provide links with international skill standards.
- Communicate the need and basis for education reform to employers, employees, and the community at large both on local and national levels.

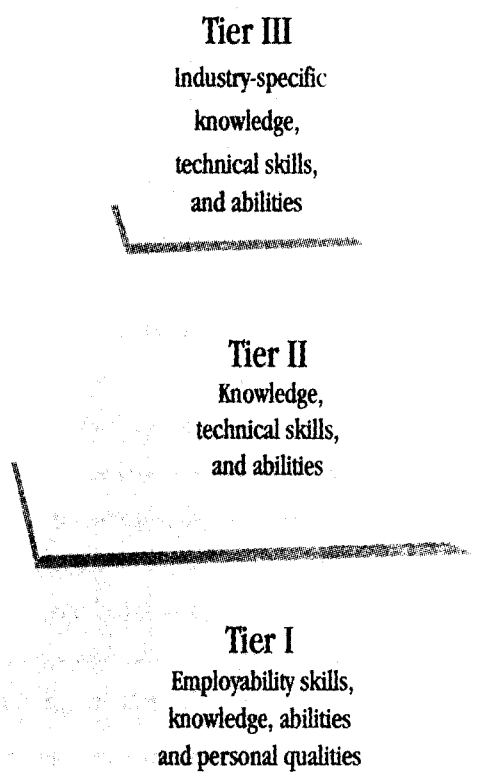
Skill Standards and the Pyramid of Competencies

The Pyramid of Competencies is a depiction of skill standards in three broad skill categories.

Tier I, at the broadest level, is the set of employability skills, knowledge, abilities, and personal qualities required of all workers to be successful in today's workplace. These are the universal skills (problem solving, team skills, and flexibility) that are needed to apply technical knowledge and tools effectively.

Tier II consists of the knowledge, technical skills, and abilities that are common to all jobs within a family of related jobs across all industries.

Tier III consists of industry-specific knowledge, technical skills, and abilities that are unique to individual jobs and are the most prone to rapid change.



A Model of Continuous Improvement:

Step 1: Skill Standards Development

- Compile and research existing competency based education and skill standards literature.
- Assemble panels of agricultural professionals for focus panels.
- Conduct a survey of currently employed agricultural workers to determine level of SCAN skills required for the job.
- Develop work-related scenarios to place the skill standards in the context of the work environment.
- Disseminate skill standards information to involved parties from industry, education, and labor for their review and editing.

Step 2: Assessment

- A person generates and collects evidence of his or her ability to perform at the levels determined by the skill standards.
- A student, trainee, apprentice, prospective agricultural professional seeking additional training is assessed to determine present skill level through direct and indirect evidence.
- Direct evidence includes observation of the person who is assessed.
- Indirect evidence includes supporting information.
- Assessment results meet the criteria of validity, currency, authenticity, and sufficiency.
- Demonstration of validity is a tangible item or record of action.
- Demonstration of relevancy is evaluated against current standards.
- Demonstrations of authenticity show that the individual being assessed performs key activities.
- Demonstration of sufficiency provides enough evidence to match primary key activities and performance indicators of the skill standards.

Step 3: Curriculum Development

- Revise existing curriculum to better meet the current and future needs of the employers.
- Where necessary, develop new curriculum and establish new programs based on these competencies.
- Develop program outcomes for specific programs, including Tech Prep, certificate, associate degree, and bachelor degree.

Step 4: Articulation

- Develop models to support the articulation of program outcomes and competencies between systems.
- Establish articulation agreements between existing programs to ensure portability of skills.
- Connect competencies and Certificates of Competency with benchmark documentation to build national portability systems.

Step 5: Continuous Updating

- A continuous exercise by all partners of revising and validating skill standards on a regular basis is necessary. Updating of curriculum and current training methods to meet workplace standards is required for success in national economic development.
- Individual agricultural professionals must have access to clearly stated competency goals and national levels; the nation can begin to resolve the workforce shortages faced today.

The Process for Building Skill Standards

The process for building Skill Standards was derived from Washington State Skill Standards Guidebook I. The process included the following steps:

1. Research other competency-based education, other skill standards projects and other relevant literature.
2. Conduct Skill Standards Template A and Template B focus panel discussions to identify critical work functions and key activities, plus required skills, knowledge, and abilities.
3. Establish and document relationships between key activities and
   - Performance Indicators
   - Technical Knowledge
   - Employability Skills

Skill Standards to Curriculum

Moving Skill Standards to curriculum is a continuous process. It is the anticipation of the study participants that the skill standards generated in this project will be used by education partners to develop and/or modify curriculum at the community college level and improve career counseling at the high school level. By providing the necessary input from employees and employers, this skill standards document is a first step in the development or modification of curriculum. The project participants hope the Skill Standards Project serves the education establishment in particular and is received as an example of the potential of skill standards.

In order to keep current with a rapidly changing world, standards need to be reevaluated and updated on a regular basis, with full partner participation at each step. New developments impact the ways workers organize and apply their skills, including time management and interpersonal relationships. Increased technological complexity may simplify some of the job tasks but make others more intricate. Today's agricultural professionals are asked to acquire a broader range of decision-making and educational skills as well as keeping current with emerging trends in agriculture. Ongoing changes must be reflected in community college, technical college, and high school curricula in order to meet the needs of employers.

Introduction to Agriculture Skill Standards Project

Project Goals

- Identify skill standards for agriculture. The standards will serve as benchmarks for entry into certain agricultural careers.
- Disseminate the results and support their use by employers and employee organizations.

Guiding Principles

- Experienced employees are the experts in their career fields, are best able to identify the work performed, and the skills, knowledge, and abilities required to be successful in a work setting.
- Employers, employee organizations, and the institutions that train in agriculture must work as partners to ensure the link between the employer expectations and the postsecondary curriculum.
- The standards must be consistent with existing civil rights laws and practices.
- Standards must be flexible and portable.

- Standards should be updated continuously.
- Skill standards describe the major critical work functions and key activities, as well as the performance indicators, technical knowledge and skills, employability skills, and attributes needed to perform those functions well.
- Integrated skill standards define critical work functions, the key activities related to the functions, plus the level of skill required to perform the critical work functions and key activities in the context of work settings.
- Skill standards must be voluntary and adaptable to regional and local needs.
- Skill standards should apply to a family of related jobs, rather than to very narrow job titles.

The Identification of Skill Standards

Following the State of Washington guidelines for the establishment of skill standards, multi-employer focus panels were called together to develop skill standards templates A and B. Separate focus panels were held for:

- John Deere Agricultural Equipment Technician.
- Irrigation Technologist.
- Turf Management Technician.
- Turf Equipment Service Technician.
- Agricultural and Diesel Equipment Mechanic.

The focus panels first identified the critical work functions and key activities that have definite beginning and ending points during a working day. According to Skill Standards definitions these work functions and key activities must be actions that could be videotaped and entered on a list of specific actions to be executed during a specific workday. The focus panels also discussed the performance indicators, the technical knowledge, the employability skills, and personal qualities associated with the above agricultural professions.

In addition, each focus panel participant and a sample of agricultural professionals from across Washington State were asked to complete a survey instrument based on broad employability skills. The survey instrument employed was the ADVANCE ™ Workplace Standards Skill Inventory from Advance Educational Spectrums, Inc. The employability skills on which the survey instrument is based were derived from the SCANS Report (Secretary's Commission on Achieving Necessary Skills).

The SCANS report issued in 1991 identified workplace competencies and employability skills required for the workforce. For each of 37 SCANS skills, survey respondents identified which of five levels of difficulty best represented the appropriate skill level required to do the position under study. Then the relationships between key activities and the following were established.

- Performance indicators that tell how it is known when a key activity is performed well.
- Technical knowledge that details the skills, abilities, and tools employed in agriculture.
- Employability skills that detail the foundation abilities needed in agriculture.

SKILL STANDARDS FOR AGRICULTURE

The Skill Standards for Agriculture Project was a continuation of historic efforts and work in progress aimed at clarifying the roles and educational requirements for certain agricultural professions. In the following pages some of this foundation work is shown in order to illustrate the historic perspective and fundamental grounding of the current study.

Agriculture Skill Standards were developed after careful consideration of historic efforts. DACUM documents concerning agriculture were inspected and became a part of the materials considered by the Skill Standards focus panel discussions.

Historic DACUM Chart Templates A and B

The following pages contain the Skill Standards for these careers:

- John Deere Agricultural Equipment Technician, Agricultural and Diesel Equipment Mechanic
- Irrigation Technologist
- Turf Management Technician
- Turf Equipment Service Technician

Each of the following sections contains:

- The Historic DACUM Chart for the occupational group
- Skill Standards Template A
- Skill Standards Template B
- Validation Survey Results
- SCANS Skill Survey Results

About The Skill Standards Charts:

Each chart contains the following five components:

Critical Work Function:
Critical Work functions represent the general areas of responsibility. The critical work functions list what must be done to achieve the key purpose of the occupation.

Key Activity:
Key activities are related to the critical work functions. The Key Activity listing lists major tasks performed by workers. The question was asked, "What are the key activities needed to perform each critical work function?" Key activities are made up of measurable and observable work activities, which end in a product, service, or decision, and have a definite beginning and an end.

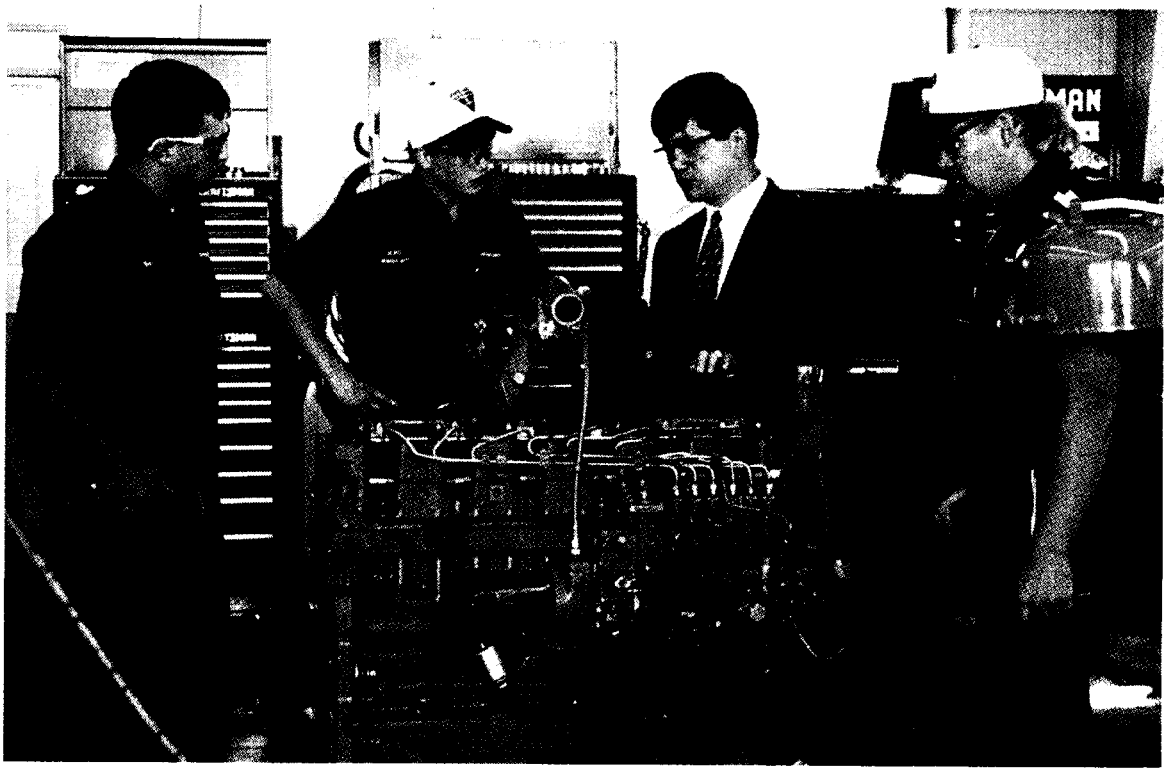
Performance Indicators for Each Task:
Performance indicators are specific behavioral evidence of a worker's achievement of skills, knowledge, and key activities. The critical work functions

and key activities begin to reflect a picture of work requirements in each occupation, but that is not enough. The question that needs to be answered is, "How do we know when this key activity is performed well?"

Technical Skills, Knowledge, Abilities, and Tools:
Technical skills, knowledge and abilities, including tools, are those areas of expertise which workers must have in order to perform a given occupational key activity with excellence.

Employability Skills:
Employability Skills are basic academic and foundation skills that are needed to build more advanced competencies. Employability skills are competencies required by workers in order to obtain meaningful work and participate in the modern workforce. They fall into the categories of basic skills, thinking skills, and personal qualities.

JOHN DEERE AGRICULTURAL EQUIPMENT TECHNICIAN, AGRICULTURAL AND DIESEL EQUIPMENT MECHANIC



HISTORIC DACUM CHART FOR JOHN DEERE AGRICULTURAL EQUIPMENT TECHNICIAN

Focus Panel Members
Mark Knopp, Farmway Implement
Mark Peterson, Arrow Machinery
Terry Dejuan, RDO Equipment
Jay Hanger, Tumac Machinery, Inc.
Terry Keller, Carrol Adams Tractor Co.
Gayle LeFore, Tate Transportation, Inc.
Chuck Hull, Western Power and Equipment
Jim Hinsley, Hyster Sales Co.
Mark Kessler, R & B Ag Machinery, Inc.
Bill Bishop, Jim's Pacific Garages, Inc.
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Dave Eids, Walla Walla County Maintenance
Dan Zenger, Walla Walla City
Dick Yost, Valley Transit
Greg Nilson, Spokane Detroit Diesel-Allison
Duane Smalley, Tri-cities Freightliner
Kevin Willis, Rowand Machine Co.
Skip Knapik, Central Premix Concrete Co.

COMPETENCY PROFILE OF JOHN DEERE AGRICULTURAL EQUIPMENT TECHNICIAN

Duties: A. EQUIPMENT							
Tasks:							
A1. Demonstrate preventative maintenance	A2. Demonstrate machine functions	A3. Diagnose, test and repair engines	A4. Diagnose, test and repair power trains	A5. Diagnose, test, repair electrical and electronic systems	A6. Diagnose, test and repair hydraulics	A7. Diagnose, test and repair air quality systems	A8. Diagnose, test and repair steering & brakes

Duties: B. COMMUNICATION							
Tasks:							
B1. Listen actively	B2. Speak effectively	B3. Ask problem related questions	B4. Gather information	B5. Analyze information	B6. Follow directions	B7. Interpret pertinent information	B8. Communicate technical information

Duties: C. CUSTOMER SERVICE						
Tasks:						
C1. Show interest in customer problem	C2. Identify solution	C3. Discuss options	C4. Implement solution	C5. Respect customer confidentiality	C6. Perform what you promise	C7. Manage stress

Duties: D. TECHNICAL INFORMATION						
Tasks:						
D1. Access available resources	D2. Select reference material	D3. Retrieve specific information	D4. Apply specific information	D5. Read schematics	D6. Apply computer technology	D7. Demonstrate computer literacy

Duties: E. DIAGNOSTICS & TESTING						
Tasks:						
E1. Operate equipment	E2. Verify complaint	E3. Select correct test equipment	E4. Install correct test equipment	E5. Analyze test results	E6. Demonstrate efficient troubleshoot-ing	E7. Reach conclusion

Duties: F. REPAIR							
Tasks:							
F1. Select appropriate tools	F2. Gain access to problem	F3. Analyze damage	F4. Determine causes	F5. Determine parts needed	F6. Estimate repair cost	F7. Reassemble components to specifica-tions	F8. Install proper fluids
F9. Verify proper operation							

Duties: G. DOCUMENTATION			
Tasks:			
G1. Record machine/ service data	G2. Explain cause and work performed	G3. Process warranty information	G4. Complete work order

Duties: H. SAFETY				
Tasks:				
H1. Demonstrate proper use of safety equipment	H2. Maintain clean work area	H3. Recognize and report unsafe practices	H4. Follow emergency procedures	H5. Dispose of hazardous materials properly

Duties: I. COMPANY/DEALERSHIP POLICIES					
Tasks:					
I1. Follow dealership policies	I2. Demonstrate professional-ism	I3. Maintain professional appearance	I4. Respect company equipment	I5. Maintain confiden-tiality	I6. Obtain necessary licenses

Duties: J. METAL WORKING		
Tasks:		
J1. Demonstrate welding skills	J2. Demonstrate basic metal fabrication	J3. Operate machining tools

Historic DACUM Chart For Agricultural and Diesel Equipment Mechanic

COMPETENCY PROFILE OF AGRICULTURAL AND DIESEL EQUIPMENT MECHANIC

Duties: A. SAFETY

Tasks:

A1. Follow company safety policy	A2. Familiarity with L&I regulations & requirements (OSHA,WISHA, etc.)	A3. Familiarity with the Dept of Ecology's hazardous waste/material management policies	A4. Utilize safety equipment (guards, etc.)	A5. Locate and utilize safety equipment (first aid kit, fire ext., and information)	A6. Report unsafe shop practices and equipment to appropriate personnel	A7. Maintain a safe and clean working environment for yourself and others	A8. Use appropriate personal protective equipment
A9. Locate and understand MSDS safety information	A10. Demonstrate proper use of lifting equipment, jack stands, presses, cribbing, etc.	A11. Inspect equipment and inform customer of safety hazards					

Duties :B. BASIC SKILLS

Tasks:

B1. Communicate and work well with others	B2. Demonstrate mechanical aptitude	B3. Recognize personal limitations and ask for assistance	B4. Read and interpret technical manuals	B5. Perform mathematical functions	B6. Identify the functions and limitations of tools and equipment	B7. Utilize appropriate tools for a task	B8. Fill out work orders correctly and legibly
B9. Maintain personal and company tools							

Duties: C. PROFESSIONALISM

Tasks:

C1. Follow company procedures and policies	C2. Possess mature work skills/habits	C3. Demonstrate leadership skills	C4. Demonstrate flexibility in job assignments	C5. Accept constructive criticism	C6. Follow instructions	C7. Display a positive and safe attitude	C8. Demonstrate accountability and efficiency
C9. Offer positive suggestions to improve efficiency	C10. Possess pride in workmanship	C11. Willingness to upgrade education and training					

Duties: D. CUSTOMER RELATIONS

Tasks:

D1. Exhibit professional demeanor	D2. Demonstrate honesty	D3. Maintain positive company image	D4. Communicate in a clear, concise, professional manner	D5. Listen and interpret customer needs	D6. Explain repair procedures to customer	D7. Refer customer to appropriate personnel	D8. Inform/ update customer regarding cost of repairs
D9. Differentiate between the repair and replacement of parts	D10. Maintain accurate service records						

Duties: E. DIAGNOSE & REPAIR ENGINES

Tasks:

E1. Follow manufac-turer's guidelines and specifications	E2. Utilize precision measuring & diagnostic equipment	E3. Diagnose and repair internal mechanical systems	E4. Diagnose and repair fuel systems	E5. Diagnose and repair cooling systems	E6. Diagnose and repair ignitions systems	E7. Diagnose and repair exhaust brakes and retarders	E8. Diagnose and repair lubrication, filtration and heat exchanger systems

Duties: F. DRIVE / POWER TRAINS

Tasks:

F1. Read and interpret technical manuals	F2. Follow specifications for use of lubricants and coolants	F3. Diagnose and repair differentials	F4. Diagnose and repair clutches	F5. Diagnose and repair final drives	F6. Diagnose and repair torque converters	F7. Diagnose and repair drive lines and universal joints	F8. Diagnose and repair power shift transmissions
F9. Diagnose and repair transfer and gear reduction cases	F10. Diagnose and repair power takeoffs (live and independent)	F11. Diagnose and repair planetary drives	F12. Diagnose and repair direct drive transmissions	F13. Measure and determine percent of wear on crawler under-carriage parts	F14. Align, adjust and repair crawler undercarriage		

Duties: G. HYDRAULIC SYSTEMS

Tasks:

G1. Follow hydraulic system safety procedures	G2. Follow environmental procedures and regulations	G3. Possess a working knowledge of hydraulic systems	G4. Identify hydraulic components and functions	G5. Utilize charts and tech manuals to conduct diagnostic tests	G6. Repair components and systems as needed	G7. Be familiar with crimping, couplings and hydraulic hose specifications	G8. Follow specifications for the use of lubricants and coolants

Duties: H. ELECTRONIC/ELECTRICAL SYSTEMS

Tasks:

H1. Read and interpret technical manuals	H2. Utilize diagnostic equipment	H3. Diagnose & repair on-board computer & monitoring systems	H4. Diagnose and repair electronic / electrical systems	H5. Diagnose and repair charging/ starting systems

Duties: I. STEERING, BRAKES & SUSPENSION

Tasks:

I1. Recognize environmental and hazardous waste responsibilities	I2. Be familiar with Dept. of Transportation regulations	I3. Diagnose and repair a variety of brake types	I4. Diagnose and repair steering systems (power & manual)	I5. Diagnose and repair suspension systems	I6. Check and adjust wheel suspension alignment	I7. Test and adjust systems after repair	I8. Follow specifications for the use of lubricants and coolants

Skills Standards Templates A & B For John Deere Agricultural Equipment Technician, Agricultural and Diesel Equipment Mechanic

SKILL STANDARDS TEMPLATE A

Summary Critical Work Function and Key Activities

Works to provide high-quality customer service in all phase of equipment repair

A. DIAGNOSE AND TEST EQUIPMENT
A1. Verify complaint
A2. Test-run equipment to analyze condition
A3. Install test equipment
A4. Conduct test procedures
A5. Analyze test results
A6. Evaluate repair options for solution of problem

B. REPAIR EQUIPMENT
B1. Gain access to problem
B2. Analyze for damage and determine cause of failure
B3. Determine and order parts needed
B4. Repair equipment as directed
B5. Verify proper operation
B6. Dispose of hazardous materials and restore work area

C. COMPLETE DOCUMENTATION
C1. Maintain daily time records
C2. Complete and maintain work order
C3. Process warranty information

SKILL STANDARDS TEMPLATE B

Critical Work Function A: DIAGNOSE AND TEST EQUIPMENT

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
A1. Verify complaint	• Customer's complaint is clearly understood and that understanding is conveyed. • Customer is communicated with in a respectful manner. • Complaint is completely documented.	• Knowledge of equipment and product. • Knowledge of equipment operation.	• Ability to interpret and clarify information. • Ability to communicate professionally including tact and diplomacy, prompting, clarifying and listening skills. • Ability to actively participate in discussion. • Ability to extract information. • Ability to modify behavior to environment. • Ability to record information completely, accurately and legibly.
A2. Test-run equipment to analyze condition	• Equipment is operated safely. • Equipment condition is accurately identified. • Technician seeks supervision until he can confidently perform the task.	• Knowledge of equipment operation and safety precautions for both new and old technology. • Knowledge of component operation.	• Ability to follow safety rules/policies. • Ability to identify symptoms. • Ability to examine information. • Ability to analyze possible causes/reasons. • Ability to recognize personal limitations. • Ability to use logic to draw conclusions.
A3. Install test equipment	• Reference materials are consulted to accurately determine appropriate test equipment and procedure. • Test equipment is safely and properly installed.	• Knowledge of sources of resource materials and ability to access them. • Knowledge of how test equipment operates. • Ability to safely install test equipment.	• Ability to understand technology applications and operation. • Ability to identify appropriate technology. • Ability to comprehend reference materials. • Ability to apply appropriate principles/ laws/theories to situation. • Ability to follow set of instructions.

Critical Work Function A: DIAGNOSE AND TEST EQUIPMENT

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
A4. Conduct test procedures	• Tests are performed safely. • Reference procedures are accurately followed. • Findings are accurately recorded.	• Knowledge of safety issues concerning test procedures. • Knowledge of proper use of test equipment and procedures.	• Ability to utilize technology applications and follow proper procedures. • Ability to apply principles to procedure to extract information. • Ability to collect and record information accurately, completely, and legibly.
A5. Analyze Test results	• Test results are compared to manufacturer's specifications and the problem is accurately identified. • Test results and conclusions are reported to supervisor and approved as accurate.	• Basic knowledge of engine, power train, hydraulic, air quality, electrical, steering and brake systems. • Knowledge of manufacturers' specifications • Ability to interpret information.	• Ability to analyze possible causes. • Ability to diagnose performance deviations. • Ability to communicate findings both orally and in written form. • Ability to read diagrams and schematics. • Ability to logically draw conclusions from findings. • Ability to comprehend manufacturer's reference materials.
A6. Evaluate repair options for solution of problem	• Customer is completely satisfied with course of action subsequently chosen. • Repair options are completely discussed with supervisor and appropriate cause of action is recommended.	• Ability to assist supervisor in "selling" customer on the recommended repair option. • Knowledge of repair options.	• Ability to gather information. • Ability to communicate conclusions and be open to other opinions. • Ability to perform basic calculations. • Ability to evaluate and compare alternatives. • Ability to recommend ethical course of action. • Ability to present information and actively participate in discussion. • Ability to demonstrate commitment to customer.

Critical Work Function B: REPAIR EQUIPMENT

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
B1. Gain access to problem	• The appropriate reference material for the repair is accurately selected. • Appropriate shop equipment and tools for the job are utilized safely and effectively. • Problem is efficiently accessed following established procedure for disassembly.	• Knowledge of safe and proper use of special tools and equipment. • Knowledge of resource materials. • Knowledge of engine, power train, hydraulic, air quality, electrical, steering and brake systems and their functions. • Knowledge of proper procedure for disassembly of equipment and/or components.	• Ability to select appropriate references, identify relevant specifications, and follow set of instructions. • Ability to understand requirements of the task and the technological results. • Ability to follow rules and procedures.
B2. Analyze for damage and determine cause of failure	• Appropriate precision measuring devices are selectively used to evaluate extent of wear or damage to components. • All damaged and/or worn components are accurately identified. • All information is completely evaluated and possible causes of failure are determined. • Technician's evaluation is reported to supervisor and cause of failure is correctly determined.	• Knowledge of types and uses of precision measuring devices. • Ability to operate precision measuring devices. • Ability to compare measurements to equipment specifications and draw conclusions. • Ability to visually inspect parts and recognize damage or wear. • Basic knowledge of engine, power train, hydraulic, air quality , electrical, steering and brake systems and their functions.	• Ability to identify available technology. • Ability to recognize details associated with system operation. • Ability to use logic to draw conclusions. • Ability to identify system malfunction/failure. • Ability to interpret information and analyze possible causes. • Ability to assimilate information to form conclusions. • Ability to communicate complex information and participate in discussion. • Ability to communicate conclusions and be open to other opinions.

Critical Work Function B: REPAIR EQUIPMENT

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
B3. Determine and order parts needed	• All worn, damaged, and subsequently damaged parts are completely identified for replacement or repair. • Parts list is accurately created and is submitted to supervisor for approval.	• Knowledge of parts terminology. • Ability to recognize all damaged or worn parts associated with failure. • Ability to create a complete and accurate list of parts.	• Ability to recognize details affecting system operation. • Ability to record information and complete forms accurately. • Ability to follow policies\procedures. • Ability to demonstrate honesty and trustworthiness. • Ability to use computers and perform data entry.
B4. Repair equipment as directed	• The appropriate reference material for the repair is accurately selected. • Repair procedures are accurately followed as outlined in reference material. • Equipment is safely and correctly assembled and repaired to a condition consistent to customer's expectations. • All fluids and filters are properly installed and equipment is ready for operation. • Equipment is cleaned consistent with customer expectations.	• Knowledge of equipment reference material. • Knowledge of safety procedures. • Basic knowledge of engine, power train, hydraulic, air quality, electrical, steering and brake systems and their functions. • Ability to perform basic repair functions such as welding, cutting, and fabrication. • Knowledge of fluid types and their applications. • Ability to use cleaning equipment (solvents, spray guns, steam).	• Ability to follow instructions from references and/or supervisor. • Ability to convert numerical data. • Ability to monitor personal performance (workmanship) and accept responsibility. • Ability to apply self-management. • Ability to interpret and apply new knowledge and experiences. • Ability to efficiently manage time. • Ability to troubleshoot system malfunctions.

Critical Work Function B: REPAIR EQUIPMENT

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
B5. Verify proper operation	• Test equipment is re-installed and test results are within manufacturer's guidelines. • Equipment is safely test-driven to ensure equipment is operating properly and consistent with customer's expectations.	• Understanding of equipment and component operation and safety precautions. • Ability to safely install and operate appropriate test equipment. • Ability to recognize customer's expectations. • Ability to operate equipment and evaluate condition. • Ability to compare test results to specifications to confirm operation.	• Ability to evaluate performance of technology. • Ability to monitor system performance. • Ability to demonstrate commitment to customer.
B6. Dispose of hazardous materials and restore work area	• All hazardous materials are safely disposed within correctly labeled containers according to government regulations. • Workspace is clean, safe, and organized to supervisor's expectations.	• Ability to identify all hazardous materials. • Knowledge of safe handling and disposal procedures for hazardous materials. • Ability to locate MSDS sheets, first aid kits, and follow proper emergency procedures. • Knowledge of how to maintain a safe working environment. • Knowledge of supervisor's expectations. • Knowledge of special tool and shop equipment location.	• Ability to follow set of instructions. • Ability to follow rules, policies, and procedures. • Ability to actively participate in team activities. • Ability to apply self-management skills. • Ability to monitor performance. • Ability to lead by example. • Ability to maintain materials in a safe and efficient manner.

Critical Work Function C: COMPLETE DOCUMENTATION

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
C1. Maintain daily time records	• All required time keeping records are completed accurately and legibly. • All daily time records are submitted to appropriate personnel in a timely manner.	• Knowlege of company procedures regarding daily time record. • Knowledge of time record submittal policies and procedures.	• Ability to record information accurately. • Ability to understand the necessity for time keeping functions. • Ability to use a computer or bar-coding system. • Ability to track task progress. • Ability to attend regularly and demonstrate punctuality. • Ability to demonstrate trustworthiness and accept responsibility for own behavior. • Ability to efficiently manage time.
C2. Complete and Maintain Work Order	• All equipment data has been accurately entered including model, machine and component serial numbers, and operation hours. • All safety and maintenance items are completely recorded. • All recommended repairs not performed due to nonauthorization by customer are documented. • All maintenance and repair items are accurately recorded and addressed. • All fluids and shop supplies used for the repair and any disposal of hazardous wastes are properly accounted for. • Customer supplied parts or fluids are accurately recorded.	• Knowledge of information required on work order. • Knowledge of where to locate information required for work order. • Knowledge of service pricing guides and their function. • Ability to record information accurately and legibly.	• Ability to use computer. • Ability to identify and obtain data relevant to task. • Ability to describe repair work clearly in written form.

Critical Work Function C: COMPLETE DOCUMENTATION

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
C3. Process warranty information	• Warranty parts removed are properly tagged and stored. • All warranty paperwork is completely filled-out.	• Knowledge of information required on warranty paperwork. • Knowledge of tagging and storage procedures for warranty parts.	• Ability to follow rules, policies, and procedures. • Ability to use computer. • Ability to communicate in written form. • Ability to record information accurately and legibly. • Ability to identify and obtain data relevant to task.

SCENARIOS

The use of scenarios based on real life work situations provides a powerful contextual tool to assist the professional in this area of expertise in understanding and mastery of the necessary knowledge, skills, and abilities needed to work within this profession.

These three scenarios demonstrate how skill standards information can be directly applied to real workplace problems.

- **ROUTINE SCENARIO** – A typical situation that might occur during a typical day.

- **CRISIS SCENARIO** – A crisis situation that would challenge the individual to provide an appropriate and timely response.

- **LONG TERM PLANNING SCENARIO** – A long term planning situation.

For each scenario, relevant critical work functions and key activities involved in resolving the specific situations are identified. The key activities, knowledge skills and abilities necessary to approach and successfully resolve the specific work-related challenges may be referenced using the completed skill standards charts.

ROUTINE SCENARIO

Given an engine, the John Deere equipment technician performs preventative maintenance according to engine specifications.

Primary Key Activities and Critical Work Functions Involved in this Scenario:

A. Diagnose and Test Equipment
A2. Test run equipment to analyze condition
A3. Install test equipment
A4. Conduct test procedures
A5. Analyze test results

B. Repair Equipment
B4. Repair equipment as directed
B5. Verify proper operation
B6. Dispose of hazardous materials and restore work area

C. Complete Documentation
C1. Maintain daily time records
C2. Complete and maintain work order
C3. Process warranty information

ROUTINE SCENARIO

A truck engine tune-up work order is assigned to a mechanic. The mechanic needs to clock in on the job, move the truck into the service area and find the required technical information to complete the task. After the task is performed, the truck is moved outside. The service area is restored to its prior state, materials are returned to their proper places and the mechanic clocks off the job.

Primary Key Activities and Critical Work Functions Involved in this Scenario:

A. Diagnose and Test Equipment
A1. Verify complaint
A2. Test-run equipment to analyze condition
A3. Install test equipment
A4. Conduct test procedures
A5. Analyze test results
A6. Evaluate repair options for solution of problem

B. Repair Equipment
B1. Gain access to problem
B2. Analyze for damage and determine cause of failure
B3. Determine and order parts needed
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C. Complete Documentation
C1. Maintain daily time records
C2. Complete and maintain work order
C3. Process warranty information

CRISIS SCENARIO

Andy is a John Deere equipment technician who is employed by a dealership that is located in an area, which has a customer base that is predominantly dry land wheat producers. It is the height of the wheat-harvesting season and a local wheat producer has a breakdown on his only wheat combine. Andy must perform diagnostic tests to the engine to determine what the problem is. He must then correct the problem so that the engine is meeting correct performance specifications in order for this producer to continue harvest.

Primary Key Activities and Critical Work Functions Involved in this Scenario:

A. Diagnose and Test Equipment
A1. Verify complaint

B. Repair Equipment
B1. Gain access to problem
B2. Analyze for damage and determine cause of failure

B3. Determine and order parts needed.
B4. Repair equipment as directed
B5. Verify proper operation
B6. Dispose of hazardous materials and restore work area

C. Complete Documentation
C1. Maintain daily time records
C2. Complete and maintain work order
C3. Process warranty information

CRISIS SCENARIO

A mechanic receives a service call for a combine during harvest. The mechanic travels to the job site, troubleshoots the problem, and orders parts. He discovers that the parts are one day away. The customer becomes very irate and threatening. He demands that the mechanic get his machine up and running in no more than two hours. The mechanic calms the customer down and gives the customer some options. Option #1: Pay a large price and have the part delivered by overnight air express. Option #2: The customer flies to where the part is, picks it up and returns. Upon his return the mechanic will be available. The customer chooses the second option and returns with the part at 11:00 p.m., at which time the mechanic finishes the repair on the combine.

Primary Key Activities and Critical Work Functions Involved in this Scenario:

A. Diagnose and Test Equipment
A1. Verify complaint
A2. Test-run equipment to analyze condition
A3. Install test equipment
A4. Conduct test procedures
A5. Analyze test results
A6. Evaluate repair options for solution of problem

B. Repair Equipment
B1. Gain access to problem
B2. Analyze for damage and determine cause of failure
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B5. Verify proper operation
B6. Dispose of hazardous materials and restore work area

C. Complete Documentation
C1. Maintain daily time records
C2. Complete and maintain work order
C3. Process warranty information

LONG RANGE PLANNING SCENARIO

Sam is a John Deere Agricultural Equipment Technician. The John Deere dealership where Sam is employed is dealing with a customer that needs to make an investment in a new, larger tractor. Because the Technician has been working on the customer's current equipment, the Technician is asked to assist with the recommendation. The Technician reviews the customer's equipment repair records and then assists with the recommendation.

Primary Key Activities and Critical Work Functions Involved in this Scenario:

A. Diagnose and Test Equipment
A6. Evaluate repair options for solution of problem

B. Repair Equipment
B2. Analyze for damage and determine cause of failure
B5. Verify proper operation.

C. Complete Documentation
C1. Maintain daily time records
C2. Complete and maintain work order
C3. Process warranty information

LONG RANGE PLANNING SCENARIO

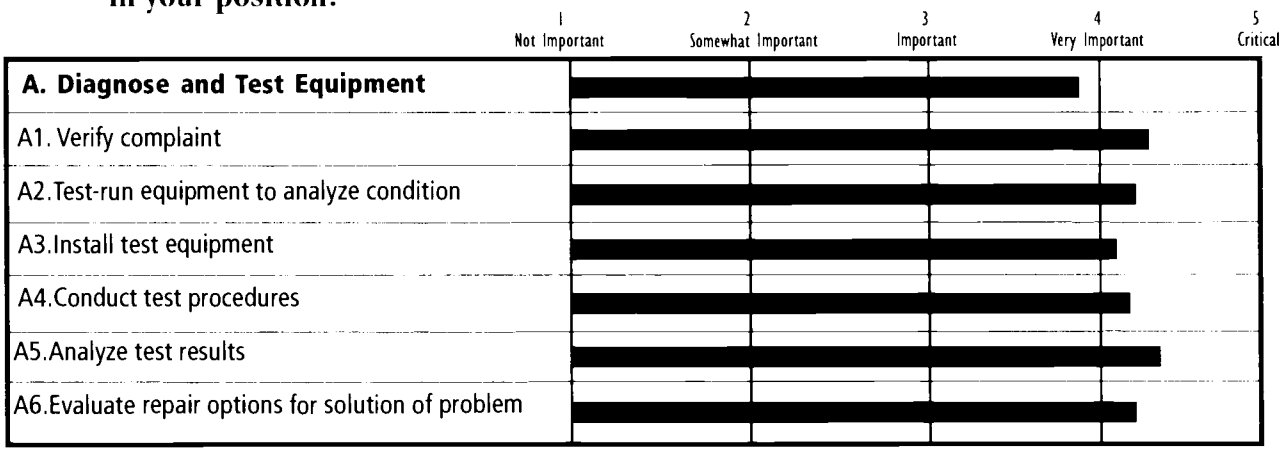
The mechanic, John, has been employed at the same company for twelve years and shows himself to be a competent employee. His boss, the shop manager, is due to retire in three years. John would like to move up in the business and arranges a meeting with the general manager. Together they plan a course of education that will help John meet his goal of being shop manager. This plan includes taking night business courses along with a customer relation's class. Over the next three years, John will assume an ever-increasing responsibility in shop matters to prove him competent to take over shop management.

Primary Key Activities and Critical Work Functions Involved in this Scenario:

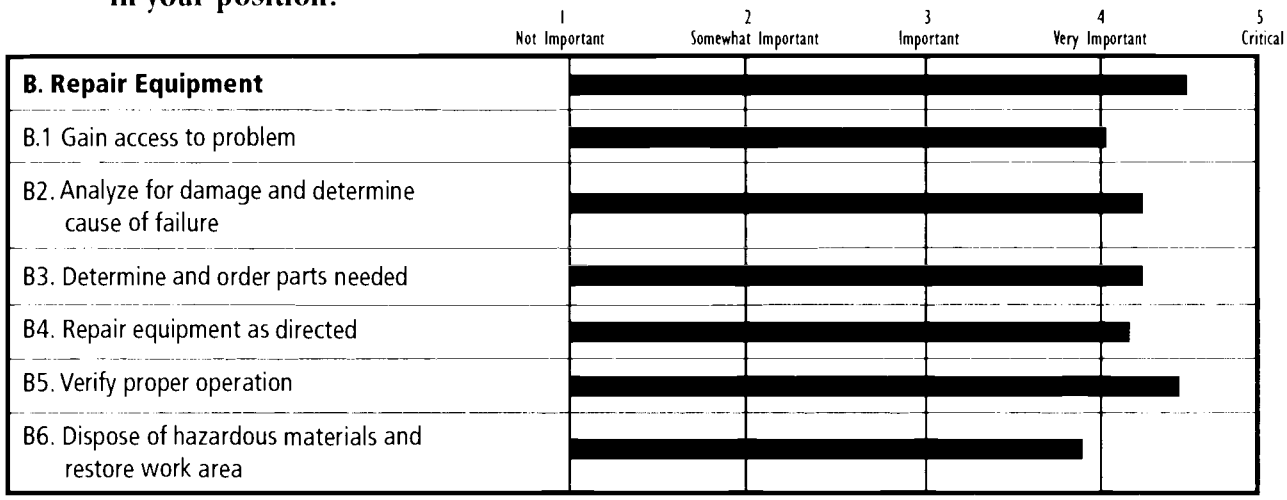
C. Complete Documentation
C1. Maintain daily time records

JOHN DEERE AGRICULTURAL EQUIPMENT TECHNICALN, AGRICULTURAL AND DIESEL EQUIPMENT MECHANIC VALIDATION SURVEY RESULTS

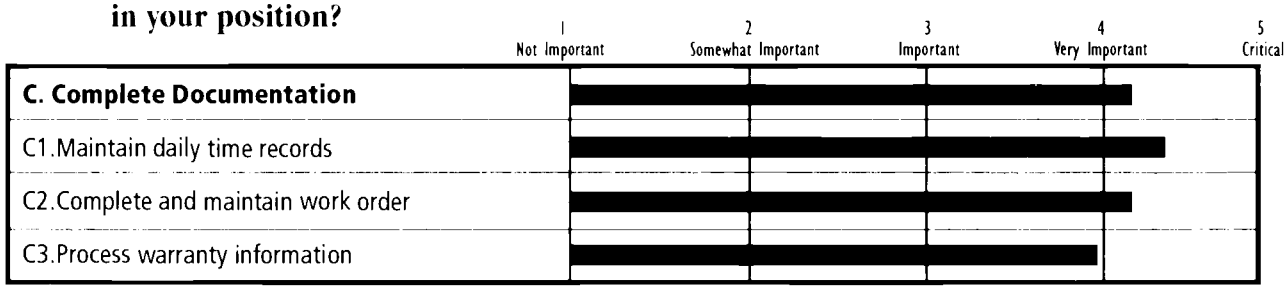
How important are these tasks in your position?



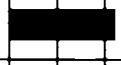
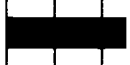
How important are these tasks in your position?



How important are these tasks in your position?

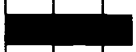
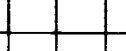
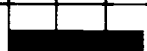


John Deere Agricultural Equipment Technician, Agricultural and Diesel Equipment Mechanic SCANS Skill Survey Results

Foundation Skills and Personal Qualities	0 1 2 3 4 5	Critical Competencies
Basic Skills		
Demonstrates Effective Reading Strategies		*Interprets, analyzes and summarizes information*
Demonstrates Effective Writing Strategies		*Writes simple documents for appropriate audience and purpose*
Applies Arithmetic Processes		*Performs measurements and interprets numerical data*
Applies Mathematics Processes		*Summarizes and translates mathematical data*
Demonstrates Effective Listening Skills		*Responds to verbal/nonverbal communication, confirms information and interprets communication*
Demonstrates Effective Speaking Skills		*Actively participates in discussion, explains concepts and poses critical questions*
Thinking Skills		
Applies Creative Thinking/ Generates Ideas		*Summarizes existing ideas and develops creative solutions*
Applies Decision Making Strategies		*Analyzes situation and considers risks, implications, and multiple viewpoints*
Recognizes and Solves Problems		*Examines situation, analyzes possible causes and recommends action plan*
Demonstrates Visualization		*Uses imagination to visualize events/activities*
Knows How to Learn		*Interprets symbols, diagrams and schematics and applies new knowledge & experience*
Applies Reasoning Skills		*Applies rules/principles to process and uses and analyzes logic to draw conclusions*

Foundation Skills and Personal Qualities	0 1 2 3 4 5	Critical Competencies
Personal Qualities		
Demonstrates Responsibility		*Works with minimal supervision, pays attention to details and follows up on assigned tasks*
Demonstrates Belief in Self Worth		*Accepts responsibility for own behavior and understands impact on others*
Demonstrates Sociability in Groups		*Modifies behavior to environment and shows empathy for others; encourages cooperation*
Demonstrates Self-Management		*Sets, adjusts goals, and demonstrates commitment to self improvement; maintains self control*
Demonstrates Integrity/Honesty		*Analyzes personal/societal implications of actions and recommends ethical course of action*
Management of Time and Resources		
Manages Time		*Prepares schedule and prioritizes, monitors, and adjusts tasks*
Manages Money		*Reconciles receipts and payments and performs routine record keeping*
Manages Materials/Facilities		*Acquires/distributes supplies and equipment*
Manages Human Resources		*Analyzes and distributes work assignments*
Management and Use of Information		
Acquires/Evaluates Information		*Identifies and analyzes data and predicts outcomes*
Organizes/Maintains Information		*Interprets information and applies processes to new information*
Interprets/Communicates Information		*Interprets information, prepares basic summaries and reports and selects methods of communication*
Uses Computers to Process Information		*Utilizes integrated software, locates information and modifies / edits information*

John Deere Agricultural Equipment Technician, Agricultural and Diesel Equipment Mechanic SCANS Skill Survey Results

Foundation Skills and Personal Qualities	0 1 2 3 4 5	Critical Competencies
Interpersonal Skills		
Participates as Team Member		*Assists team members, volunteers for special tasks and works to improve team skills*
Teaches Others		*Conducts task-specific training, coaches others to apply related concepts and provides constructive feedback*
Serves Customers		*Analyzes customer needs and resolves conflicts to customer's satisfaction*
Exhibits Leadership		*Leads by example and demonstrates commitment to excellence and displays enthusiasm*
Negotiates Agreements		*Moderates discussion, demonstrates composure, and interprets concerns*
Works with Diversity		*Demonstrates awareness of diversity*
Understanding and Management of Systems		
Understands System		*Understands the system/hierachy and follows processes and procedures*
Monitors/Corrects System Performance		*Monitors system performance and troubleshoots system malfunction*
Improves/Designs Systems		*Suggests system improvements and analyzes goals/constraints*
Use of Technology		
Selects Appropriate Technology		*Understands the requirements of the task and technological results and proposes simple technological solutions*
Applies Technology to Task		*Understands the operation/interaction and manipulates technology for desired results*
Maintains/Troubleshoots Technology		*Follows specified maintenance, identifies and troubleshoots and analyzes malfunctions and failures*

IRRIGATION TECHNOLOGIST

HISTORIC DACUM CHART FOR IRRIGATION TECHNOLOGIST

Focus Panel Members
Gary Cook, Water Watch Irrigation
Gary Martinez, Boise Cascade
Len Isaacs, Isaacs and Associates
Arlie Updegrave, Land Irrigation

COMPETENCY PROFILE OF IRRIGATION TECHNOLOGIST

Duties: A. BASIC ADMINISTRATION & SUPERVISORY

Tasks:

A1. Follow safety practices	A2. Comply with all government regulations	A3. Process company paperwork	A4. Report to supervisor	A5. Operate within budget guidelines	A6. Perform job costing functions	A7. Train coworkers	A8. Establish irrigation schedule
A9 Monitor weather							

Duties: B.CUSTOMER RELATIONS

Tasks:

B1. Listen and interpret customer needs	B2. Sell to customer's "best interest"	B3. Communicate options to customer	B4. Maintain current knowledge of products and practices	B5. Identify prospective customers	B6. Utilize internal resources (including co-worker knowledge)	B7. Perform necessary communications with suppliers	B8. Close sale
B9. Train customer in system operation	B10. Maintain ongoing customer contact						

Duties: C. DESIGN SYSTEM

Tasks:

C1. Determine cropping sequence	C2. Assess topography (weather/ water source)	C3. Assess soil	C4. Determine system type	C5. Analyze and research alternatives (cost and availability)	C6. Develop plot plan	C7. Develop sprinkler head layout	C8. Determine system pressure requirement
C9. Determine hydraulic parameters	C10. Determine pump and station type and size	C11. Size pipe and components					

Duties: D. INSTALL SYSTEM

Tasks:

D1. Inspect site	D2. Mark field location of all system components	D3. Determine construction schedule	D4. Determine necessary tools and equipment for installation	D5. Deliver products	D6. Coordinate subcontractors and site personnel	D7. Install underground piping, valves and wire	D8. Build pump station, if required
D9. Assemble or install above ground irrigation components	D10. Install electrical components	D11. Flush and adjust system					

Duties: E. OPERATE SYSTEM

Tasks:

E1. Review system design	E2. Control system operation	E3. Adhere to correct operating procedure	E4. Follow irrigation schedule	E5. Adjust equipment	E6. Monitor crop	E7. Monitor soils	E8. Adjust irrigation schedule as needed
E9. Apply chemical/ fertilizer products	E10. Monitor system operation	E11. Maintain operation record					

Duties: F. MAINTAIN SYSTEM							
Tasks:							
F1. Maintain appropriate inventory	F2. Perform preventative maintenance	F3. Update system	F4. Rebuild system components	F5. Winterize system	F6. Perform annual system start-up procedures	F7. Fill ruts	F8. Control pests

Duties: G. SERVICE SYSTEM							
Tasks:							
G1. Respond to customer needs	G2. Troubleshoot mechanical equipment	G3. Troubleshoot automated equipment	G4. Troubleshoot computerized equipment	G5. Dig up underground irrigation pipe & accessories for repair	G6. Repair or replace system components	G7. Locate and repair underground electrical faults	G8. Unplug nozzles, filters, and screens

IRRIGATION TECHNOLOGIST SKILL STANDARDS TEMPLATE A

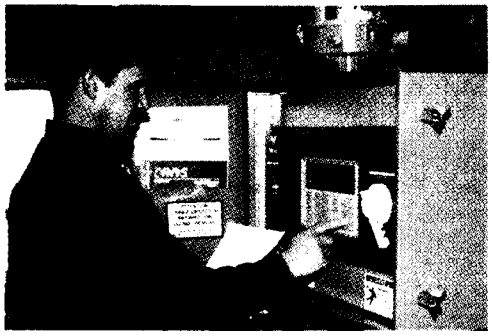
Skills Standards Templates A & B For Irrigation Technologist

Trained professional with skills and knowledge to provide high quality sales and service in the agricultural and landscape irrigation industries.

Summary of Functions & Tasks for Irrigation Technologist

Critical Work Function	Key Activity
A.Design System	
	A1. Determine crop or cropping sequence
	A2. Assess soil, topography, weather and water availability
	A3. Select irrigation system
	A4. Develop irrigation system layout
B. Install System	
	B1. Perform pre-construction walk-through
	B2. Mark field location of all system components
	B3. Stage the job
	B4. Install water supply
	B5. Install underground equipment
	B6. Assemble or install above ground equipment
	B7. Test system
C. Operate System	
	C1. Operate system
	C2. Monitor crops and soils
	C3. Adjust irrigation schedule
	C4. Adjust irrigation equipment
	C5. Apply chemicals
D. Maintain System	
	D1. Manage inventory
	D2. Perform preventive maintenance
	D3. Perform annual system start-up
	D4. Rebuild system components
	D5. Winterize system
	D6. Update system
E. Repair System	
	E1. Trouble-shoot mechanical equipment failures
	E2. Trouble-shoot electrical equipment failures
	E3. Trouble-shoot computer equipment failures

IRRIGATION TECHNOLOGIST SKILL STANDARDS TEMPLATE B



Critical Work Function A: DESIGN SYSTEM

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
A1. Determine crop or cropping sequence	• All crops grown in area are considered. • Market viability of all potential crops is accurately assessed. • Recommendation is made to client based on market analysis and individual field conditions. • Final cropping decision is made by client	• Knowledge of growing conditions and growing requirements of local crops. • Knowledge of access to local agricultural markets. • Ability to match crops with area conditions. • Ability to assess field conditions. • Ability to assist client in cropping decision. • Ability to convert numerical data.	• Ability to generate and evaluate alternative solutions and predict outcomes based on experience/prior knowledge. • Ability to recognize and respond to client needs. • Ability to demonstrate commitment to client. • Ability to present basic information and concepts to client.
A2. Assess soil, topography, weather and water availability	• All water rights are processed and documented. • Climatological evaluation is complete and accurate. • Sources to evaluate soil and topography are compiled and cross checked. • Field inspections verify gathered information is accurate.	• Knowledge of soils' waterholding capacity and infiltration rates. • Knowledge of topography. • Knowledge of area weather patterns and ability to gather weather data. • Ability to evaluate properties for future crops. • Ability to research water rights. • Ability to recognize possible field obstacles and interferences.	• Ability to obtain, analyze, and integrate multiple items of relevant data. • Ability to use logic to draw conclusions. • Ability to follow rules and procedures.

Critical Work Function A: DESIGN SYSTEM

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
A3. Select irrigation system	• All viable irrigation systems are evaluated. • All cropping practices are included in decision making process. • System recommendation and/or options presented to client are in client's best interest. • Client makes final system selection.	• Knowledge of crops and cropping practices. • Knowledge of irrigation systems. • Ability to determine best system for client's farming practices.	• Ability to recognize and respond to client needs. • Ability to demonstrate commitment to client. • Ability to present basic information and concepts to client. • Ability to evaluate alternative solutions. • Knowledge of hydraulics.
A4. Develop irrigation system layout	• Sprinkler/emitter spacing is done according to industry standards for the crop and region. • Lateral layout matches sprinkler/emitter spacing. • Main line is located and sized to supply optimum water to laterals. • Pumps and valving are located to supply water to main lines and laterals at appropriate time, pressure, and volume. • An accurate and scaled as-built blueprint of system layout is provided to client.	• Knowledge of irrigation systems and components. • Ability to match up components to create a complete system. • Ability to draft a blueprint. • Ability to calculate pump, valve and pipe sizes. • Ability to apply irrigation design principles.	• Ability to analyze/assess/evaluate numerical data. • Ability to formulate new ideas/plans/approaches. • Ability to apply creative solutions to new situations. • Ability to generate and evaluate alternative solutions. • Ability to create original documents. • Knowledge of hydraulics.

Critical Work Function B: INSTALL SYSTEM

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
B1. Perform pre-construction walk-through	• All plans are consolidated and cross-referenced. • Site is inspected and all potential problems, concerns, and scheduling factors are correctly identified. • Installation schedule and procedures are established, and contractor and client agreement are obtained.	• Knowledge of irrigation installation procedures. • Knowlege of site inspection procedures.	• Knowledge of topography. • Ability to read blueprints. • Ability to prepare and organize multiple schedules. • Ability to coordinate and work with various service providers. • Analyzes situation. • Analyzes and distributes work assignments.
B2. Mark field location of all system components	• Field location marks are placed in accordance to engineering plans. • System fits the property as designed.	• Ability to utilize survey equipment to establish property boundaries and irrigation equipment locations. • Knowledge of irrigation systems and components. • Ability to locate property boundaries.	• Ability to follow set of instructions. • Ability to read and interpret blueprints. • Ability to operate technical equipment.
B3. Stage the job	• Effective delivery schedules for components are established and delivery of components is documented as they arrive on-site. • Sub-contractors are effectively scheduled.	• Knowledge of irrigation components. • Knowledge of heavy equipment operation. • Knowledge of vendors and the services they provide.	• Ability to generate installation plan. • Ability to set realistic goals. • Ability to monitor safe and efficient utilization of materials. • Ability to coordinate, acquisition, storage and distribution of materials. • Ability to communicate clearly with vendors. • Ability to manage timelines.

Critical Work Function B: INSTALL SYSTEM

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
B4. Install water supply	• The development of water supply is monitored and compliance with government regulations and design parameters is verified. • The building of pumping platform is properly monitored to verify that construction meets industry standards. • The installation of pump(s), valve(s) and necessary electrical equipment is properly monitored to verify that installation meets industry standards. • All work is performed in a timely manner in accordance with the installation schedule.	• Knowledge of water sources. • Knowledge of pumps. • Knowledge of electricity. • Knowledge of government regulations. • Ability to use hand tools safely and correctly.	• Ability to present basic ideas and information. • Ability to apply principles to situation. • Ability to formulate plan of action. • Ability to monitor work performance. • Ability to read blueprints. • Ability to manage timeline. • Knowledge of hydraulic principles.
B5. Install underground equipment	• Installation of pipe, valves, and wire is properly monitored to verify that installation is at proper location and depth. • Pipe, valves, and wire are in proper operating condition in accordance with industry and government standards. • All work is performed in a timely manner in accordance with the installation schedule.	• Knowledge of government specifications. • Knowledge of and ability to locate manufacturers' specifications. • Knowledge of safe construction/excavating equipment operation. • Knowledge of irrigation components.	• Ability to present basic ideas and information. • Ability to apply principles to situation. • Ability to formulate plan of action. • Ability to read blueprints. • Ability to monitor work performance. • Ability to manage timeline. • Ability to follow set of instructions.

Critical Work Function B: INSTALL SYSTEM

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
B6. Assemble or Install above ground equipment	• Installation of pipe, valves, electrical controls and sprinklers is monitored to verify that installation is in the proper location. • Pipe, valves, electrical controls and sprinklers are in proper operating condition in accordance to industry and government standards. • All work is performed in a timely manner in accordance with the installation schedule.	• Knowledge of government specifications. • Knowledge of and ability to locate manufacturers' specifications. • Knowledge of safe construction equipment operation. • Knowledge of irrigation components.	• Ability to present basic ideas and information. • Ability to apply principles to situation. • Ability to formulate plan of action. • Ability to monitor work performance. • Ability to read blueprints. • Ability to manage timeline. • Ability to follow set of instructions.
B7. Test system	• Electrical system operates at proper voltage and amperage. • Valves and controls operate to manufacturers' specifications. • All piping has structural integrity and delivers water at proper flow and pressure. • All sprinklers perform to manufacturers' specifications. • Equipment is operated safely and in proper sequence.	• Knowledge of electricity. • Knowledge of water hydraulics. • Knowledge of irrigation components. • Knowledge of start-up procedures. • Ability to safely use irrigation testing equipment. • Ability to interpret technical manuals. • Ability to operate irrigation equipment.	• Ability to interpret information and data. • Ability to visually analyze relationship between parts and the whole. • Ability to use logic to draw conclusions. • Ability to monitor system performance.

Critical Work Function C: OPERATE SYSTEM

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
C1. Operate system	• Correct operating procedures are adhered to according to manufacturer's specifications. • The system is operated safely. • Irrigation schedule is properly followed.	• Knowledge of irrigation systems and their components. • Knowledge of electricity. • Knowledge of crop water demands. • Ability to locate reliable and current sources of information. • Understanding of safety issues and precautions necessary for operating irrigation systems. • Ability to recognize when system is operating as designed.	• Ability to select appropriate sources of information and follow set of instructions. • Ability to monitor system performance. • Ability to understand system operations and judge system effectiveness/efficiency. • Knowledge of water hydraulics.
C2. Monitor crops and soils	• Appropriate procedures for gathering crop and soil samples are followed. • Moisture level of samples is accurately evaluated. • Information is accurately recorded in a timely manner.	• Knowledge of soil moisture and crop monitoring. • Understanding of soil moisture and crop monitoring techniques. • Ability to use various instruments and methods to measure soil and crop moistures. • Knowledge of technical terms and industry jargon. • Ability to observe factors that may affect accurate sample collecting.	• Ability to work cooperatively with others. • Ability to record numerical data. • Ability to examine information for relevance and accuracy. • Ability to pay attention to details. • Ability to prepare and organize multiple schedules. • Ability to record information accurately.

Critical Work Function C: OPERATE SYSTEM

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
C3. Adjust irrigation schedule	• Current weather conditions and soil and crop moisture levels are considered to determine appropriate irrigation schedule. • Course of action is accurately determined to maintain optimum soil moisture content. • Irrigation schedule is accurately adjusted to maintain optimum crop growth. • Water is used at maximum efficiency. • Information is accurately recorded in a timely manner.	• Ability to utilize customized computer software for the input, retrieval and evaluation of moisture data. • Knowledge of system precipitation rates. • Knowledge of weather station data. • Ability to calculate consumptive use.	• Ability to monitor and evaluate system. • Ability to calculate mathematical data. • Ability to evaluate/adjust plan of action. • Ability to interpret and analyze information. • Ability to prepare and organize multiple schedules. • Ability to pay attention to details. • Ability to ensure work quality. • Ability to record information accurately.
C4. Adjust irrigation equipment	• Appropriate reference material is selected for the adjustment. • Adjustments are within the parameters of the system. • Adjustments result in equipment operating as desired. • Adjustments are performed safely and meet government regulations for safety. • Information is accurately recorded in a timely manner.	• Knowledge of irrigation system components. • Knowledge of irrigation system operation. • Knowledge of plant-water-soil demands. • Ability to use hand tools safely and correctly. • Ability to follow proper procedures for adjusting equipment. • Ability to use meters and gauges to determine proper adjustment levels.	• Ability to determine system components to be modified or improved. • Ability to calculate mathematical data. • Ability to evaluate/adjust equipment. • Ability to interpret and analyze information. • Ability to pay attention to details. • Ability to ensure work quality. • Ability to record information accurately. • Ability to use materials in a safe and efficient manner.

Critical Work Function C: OPERATE SYSTEM

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
C5. Apply chemicals	• Chemical solutions are properly mixed and injected. • Application of chemicals is monitored for accuracy. • All established safety procedures are followed. • System is properly cleaned following application. • Chemicals are properly stored/ disposed of according to government regulations. • Information is accurately recorded in a timely manner.	• Knowledge of various chemicals for compatibility and crop related use. • Ability to safely mix chemicals into the desired concentration levels. • Knowledge of hazardous materials regulations. • Ability to use various chemical injection methods. • Ability to completely flush chemicals from system. • Ability to maintain system integrity from corrosion and plugging. *Note:* *Applicator's license desirable*	• Ability to select appropriate information and follow set of instructions. • Ability to perform basic computations. • Ability to pay attention to detail. • Ability to follow rules, policies, and procedures. • Ability to record information accurately. • Ability to monitor safe and efficient utilization of materials. • Ability to monitor system performance.

Critical Work Function D: MAINTAIN SYSTEM

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
D1. Manage Inventory	• Inventory of parts needed to keep system in operation is maintained. • Parts purchased for inventory are of desired quality. • Service is available for components in inventory. • Warranty items are handled according to manufacturer's instructions. • Inventory records are accurate and up-to-date.	• Knowledge of vendor quality and service. • Ability to evaluate used parts and components for wear. • Knowledge of Irrigation components. • Ability to utilize computer database and parts ordering software.	• Ability to record information accurately. • Ability to write warranty documents. • Ability to identify relevant components. • Ability to communicate appropriate verbal information. • Ability to translate blueprints/drawings/ diagrams. • Ability to establish rapport with co-workers and clients. • Ability to perform routine record keeping and maintain balanced accounts. • Ability to identify future material needs. • Ability to perform data entry and understand computer operation.
D2. Perform preventive maintenance	• Maintenance schedule is developed and followed. • Maintenance tasks are performed according to industry standards. • Hazardous materials are stored/disposed of properly. • Maintenance work is properly documented.	• Knowledge of irrigation components used in a system. • Knowledge of system operations. • Ability to use hand tools safely and correctly. • Knowledge of hazardous material regulations.	• Ability to follow set of instructions. • Ability to perform a given set of tasks. • Ability to read technical manuals. • Ability to use materials in a safe and efficient manner. • Ability to complete record forms.

Critical Work Function D: MAINTAIN SYSTEM

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
D3. Perform annual system start-up	• System is started according to established procedures. • All components are inspected and evaluated. • Any necessary repairs are made to the system.	• Ability to locate appropriate reference material. • Knowledge of irrigation components. • Knowledge of irrigation system layout. • Ability to evaluate irrigation components. • Ability to use meters and gauges to determine proper adjustment levels. • Ability to use hand tools safely and correctly.	• Ability to follow a set of instructions. • Ability to understand the operation of the system. • Ability to perform an assigned task. • Knowledge of water hydraulics.
D4. Rebuild system components	• Repairs are completed according to manufacturer's specifications. • Parts are re-built to like-new condition. • Parts are tested and perform as designed.	• Basic understanding of electrical, hydraulic, and mechanical components. • Ability to test components and evaluate condition. • Knowledge of safety procedures. • Ability to use hand tools safely and correctly. • Ability to replace parts in an irrigation system. • Ability to locate appropriate reference material. • Ability to recognize wear, damage and failure of components.	• Ability to follow technical manual guidelines. • Ability to follow safety procedures. • Ability to analyze component wear, damage and failure and determine cause. • Ability to determine repair procedures. • Ability to correct malfunction.

Critical Work Function D: MAINTAIN SYSTEM

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
D5. Winterize system	• System is winterized according to established procedures. • All components are inspected and evaluated. • Any necessary repairs are made to the system.	• Ability to locate appropriate reference material. • Knowledge of irrigation components. • Knowledge of water hydraulics. • Knowledge of irrigation system layout. • Ability to evaluate irrigation components. • Ability to use hand tools safely and correctly. • Ability to operate air compressor.	• Ability to follow a set of instructions. • Ability to understand the operation of the system. • Ability to perform an assigned task.
D6. Update system	• System improvements are identified and defined. • Costs are documented and return on investment evaluated. • Update plan is presented to client in a professional manner. • System updates are performed according to client's preference and function according to plan.	• Knowledge of irrigation system design and components. • Ability to evaluate cost in respect to benefits. • Ability to operate the system. • Ability to communicate professionally.	• Ability to ask relevant questions. • Ability to present technical information clearly. • Ability to analyze equipment. • Ability to create recommendations. • Ability to forecast quantitative results. • Ability to value differences of opinion. • Ability to implement plan of action. • Ability to forecast project costs. • Ability to adapt and implement new technology. • Knowledge of water hydraulics.

Critical Work Function E: REPAIR SYSTEM

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
E1. Troubleshoot mechanical equipment failures	• System is completely evaluated and cause of failure is accurately isolated. • Components are inspected for failure, and all necessary components are replaced. • System is correctly reassembled and verification is obtained that operating condition meets manufacturer's specifications.	• Knowledge of mechanical systems, their components and their relationship to each other. • Ability to test components and evaluate condition. • Knowledge of safety procedures. • Ability to use hand tools safely and correctly. • Ability to replace parts in a mechanical system. • Ability to locate and utilize appropriate reference material.	• Ability to gain information through research. • Ability to perform measurements. • Ability to make connections between old and new. • Ability to analyze possible failures. • Ability to analyze information and solutions. • Ability to perform technological solutions.
E2. Troubleshoot electrical equipment failures	• System is completely evaluated and cause of failure accurately isolated. • Components are inspected for failure and all necessary components are replaced. • System is reassembled and verification is obtained to ensure that operating condition meets manufacturer's specifications.	• Knowledge of electrical systems, their components and their relationship to each other. • Knowledge of single phase and three phase electric power. • Ability to test components and evaluate condition. • Knowledge of safety procedures. • Ability to safely and correctly use hand tools and electrical test equipment. • Ability to replace parts in an electrical system. • Ability to locate and utilize appropriate reference material.	• Ability to gain information through research. • Ability to perform measurements. • Ability to make connections between old and new. • Ability to analyze possible failures. • Ability to analyze information and solutions. • Ability to perform technological solutions.

Critical Work Function E: REPAIR SYSTEM

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
E3. Troubleshoot computer equipment failures	• System is completely evaluated and cause of failure is accurately isolated. • Components are inspected for failure and necessary components are replaced. • System is reassembled and verification is obtained to ensure that operating condition meets manufacturer's specifications.	• Knowledge of computerized systems, their components and their relationship to the irrigation system. • Knowledge of basic program input. • Ability to test components and evaluate condition. • Knowledge of safety procedures. • Ability to use electrical test equipment safely and correctly. • Ability to replace parts in a computer system. • Ability to locate and utilize appropriate reference material.	• Ability to gain information through research. • Ability to perform measurements. • Ability to make connections between old and new. • Ability to analyze possible failures. • Ability to analyze information and solutions. • Ability to perform technological solutions.

IRRIGATION TECHNOLOGIST SCENARIOS

The use of scenarios based on real life work situations provides a powerful contextual tool to assist the professional in this area of expertise in understanding and mastery of the necessary knowledge, skills, and abilities needed to work within this profession.

These three scenarios demonstrate how skill standards information can be directly applied to real workplace problems.

- **ROUTINE SCENARIO** – A typical situation that might occur during a typical day.

- **CRISIS SCENARIO** – A crisis situation that would challenge the individual to provide an appropriate and timely response.

- **LONG TERM PLANNING SCENARIO** – A long term planning situation.

For each scenario, relevant critical work functions and key activities involved in resolving the specific situations are identified. The key activities, knowledge skills and abilities necessary to approach and successfully resolve the specific work-related challenges may be referenced using the completed skill standards charts.

ROUTINE SCENARIO

Karen works for an irrigation supply company. She works 8 a.m. to 5 p.m. greeting customers in the store, helping them determine and find which parts they are in need of, and billing them for their purchases.

Primary Key Activities and Critical Work Functions Involved in this Scenario:

A. System Design
A1. Determine crop or cropping sequence
A2. Assess soil topography, weather, and water availability
A3. Select irrigation system
A4. Develop irrigation system layout

C. System Maintenance
C1. Inventory Management

CRISIS SCENARIO

Scott is an irrigation technician at a golf course. It is mid-summer and very hot. Overnight a mainline has blown and it is critical to repair it within the day to keep the greens from burning up. He assesses the damage, stages the necessary personnel and equipment to help make the repair, acquires the parts and completes the job in time to water that evening.

Primary Key Activities and Critical Work Functions Involved in this Scenario:

B. System Installation
B3. Stage the job
B5. Install underground equipment
B7. Test the system

C. System Operation
C3. Adjust irrigation schedule

D. System Maintenance
D4. Rebuild system components
D6. Update System

E. System Repair
E1. Troubleshoot mechanical equipment failures
E2. Troubleshoot electrical equipment failures
E3. Troubleshoot computer equipment failures

LONG RANGE PLANNING SCENARIO

Mike is the irrigation manager for a center pivot irrigated farm. It is his responsibility every fall to plan the next year's maintenance and operations budget. Items that need to be taken into account are: scheduling and pricing labor, estimating and costing out repair parts, estimating the amount of consumables, such as lubricants that will be needed, and ordering new vehicles.

Primary Key Activities and Critical Work Functions Involved in this Scenario:

A. System Design
A1. Determine crop or cropping sequence
A2. Assess soil topography, weather and water availability
A3. Select irrigation system
A4. Develop irrigation system

IRRIGATION TECHNOLOGIST VALIDATION SURVEY RESULTS

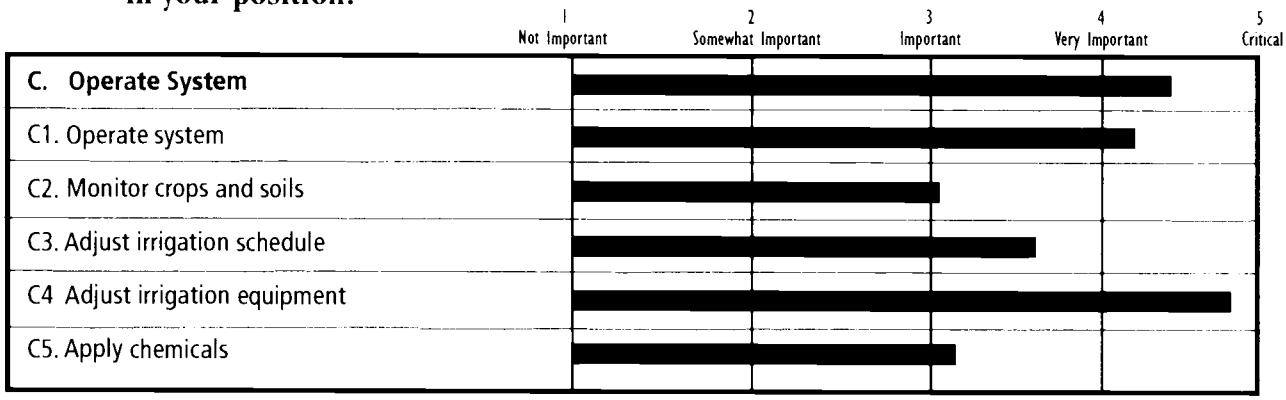
How important are these tasks in your position?

	1 Not Important	2 Somewhat Important	3 Important	4 Very Important	5 Critical
A. Design System					
A1. Determine crop or cropping sequence					
A2. Assess soil, topography, weather, and water availability					
A3. Select irrigation system					
A4. Develop irrigation system layout					

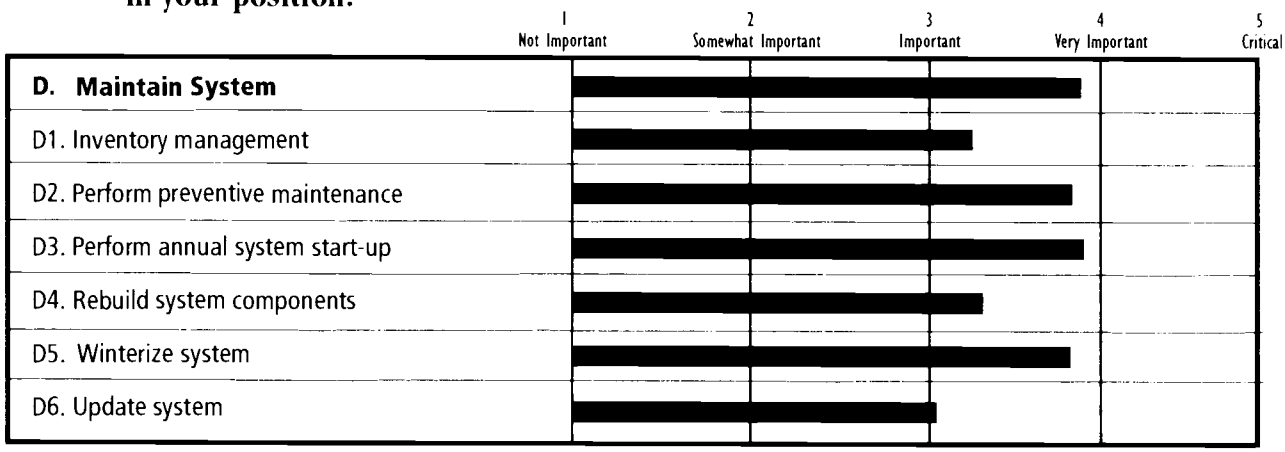
How important are these tasks in your position?

	1 Not Important	2 Somewhat Important	3 Important	4 Very Important	5 Critical
B. **Install System**					
B1. Perform pre-construction walk-through					
B2. Mark field location of system components					
B3. Stage the job					
B4. Install water supply					
B5. Install underground equipment					
B6. Assemble or install above ground equipment					
B7. Test the system					

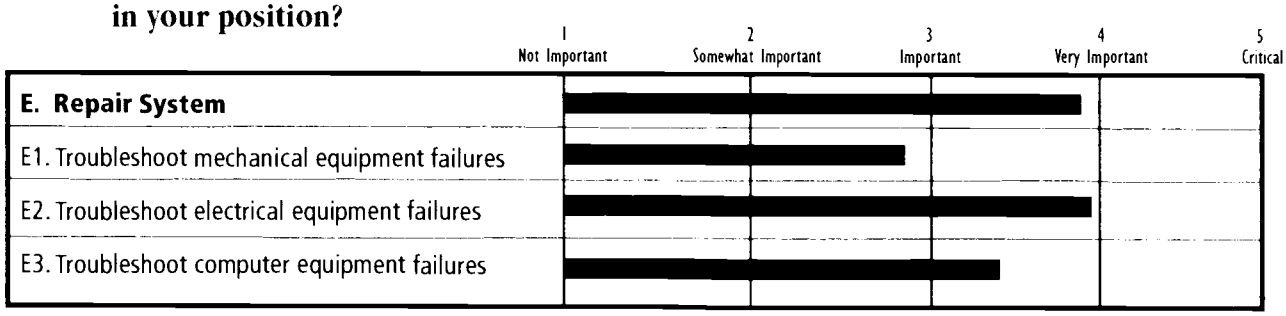
How important are these tasks in your position?



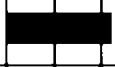
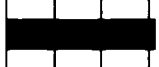
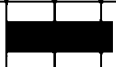
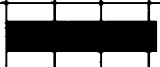
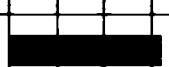
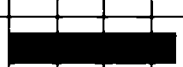
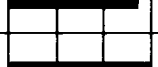
How important are these tasks in your position?

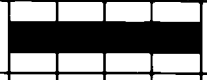
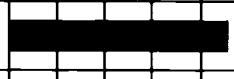
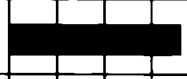
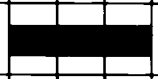
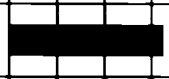
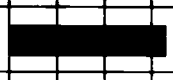
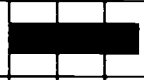
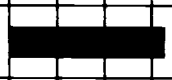
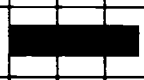
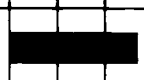
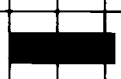
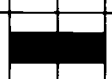
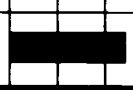


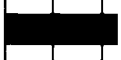
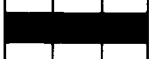
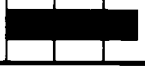
How important are these tasks in your position?

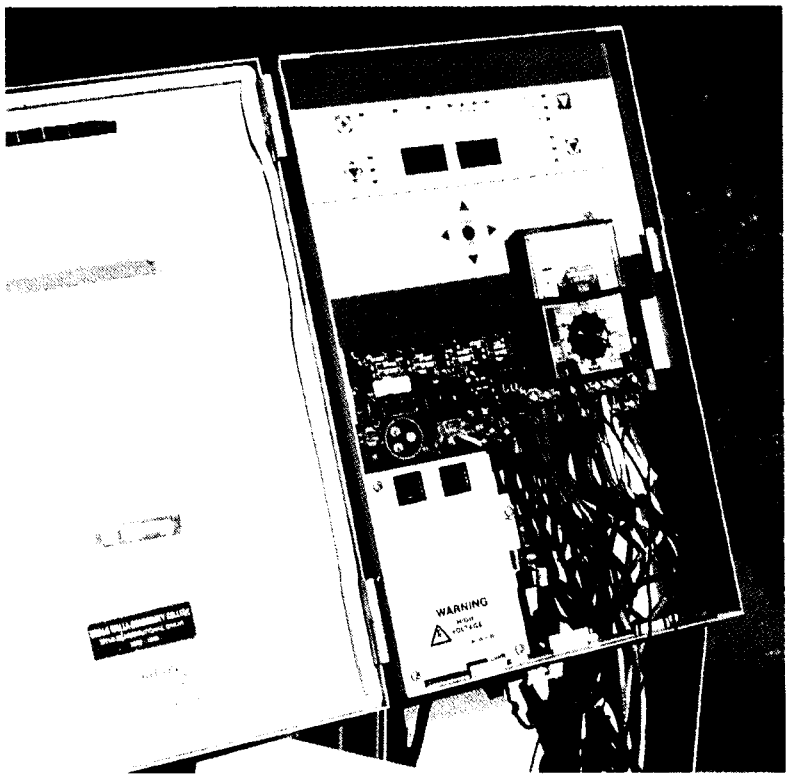


Irrigation Technologist SCANS Skill Survey Results

Foundation Skills and Personal Qualities	0 1 2 3 4 5	Critical Competencies
Basic Skills		
Demonstrates Effective Reading Strategies		*Probes to gain knowledge and interprets and summarizes information*
Demonstrates Effective Writing Strategies		*Writes simple documents for appropriate audience and purpose*
Applies Arithmetic Processes		*Converts numerical data and predicts arithmetic results*
Applies Mathematics Processes		*Summarizes and translates mathematical data*
Demonstrates Effective Listening Skills		*Interprets, clarifies, and influences communication*
Demonstrates Effective Speaking Skills		*Actively participates in discussion, explains concepts and poses critical questions*
Thinking Skills		
Applies Creative Thinking/ Generates Ideas		*Develops and applies creative solutions to new situation*
Applies Decision Making Strategies		*Analyzes situation and considers risks and implications, and generates alternative solutions*
Recognizes and Solves Problems		*Examines situation, analyzes possible causes and generates / evaluates solutions*
Demonstrates Visualization		*Uses imagination to visualize events/activities and interprets symbols and pictures*
Knows How to Learn		*Interprets diagrams and schematics, applies new knowledge and manipulates learning tools*
Applies Reasoning Skills		*Examines information / data for relevance and accuracy*

Foundation Skills and Personal Qualities	0 1 2 3 4 5	Critical Competencies
Personal Qualities		
Demonstrates Responsibility		*Monitors performance standards and follows through on assigned tasks*
Demonstrates Belief in Self Worth		*Accepts responsibility for own behavior, understands impact on others and demonstrates self reliance and self discipline*
Demonstrates Sociability in Groups		*Modifies behavior to environment and shows empathy for others; encourages cooperation*
Demonstrates Self-Management		*Sets and adjusts goals, and demonstrates commitment to self improvement maintains self control*
Demonstrates Integrity/Honesty		*Analyzes personal/societal implications of actions and formulates ethical course*
Management of Time and Resources		
Manages Time		*Prepares schedule and prioritizes, monitors, and adjusts task*
Manages Money		*Reconciles receipts and payments, performs routine record keeping and maintains balanced accounts*
Manages Materials/Facilities		*Orders and maintains inventory and monitors safe and efficient utilization of materials*
Manages Human Resources		*Analyzes and distributes work assignments and monitors performance*
Management and Use of Information		
Acquires/Evaluates Information		*Identifies and analyzes data and predicts outcomes*
Organizes/Maintains Information		*Interprets information and applies processes to new information*
Interprets/Communicates Information		*Interprets information, prepares basic summaries and reports and selects methods of communication*
Uses Computers to Process Information		*Utilizes integrated software, locates information and retrieves stored information/data*

Foundation Skills and Personal Qualities	0 1 2 3 4 5	Critical Competencies
Interpersonal Skills		
Participates as Team Member		*Works to improve team skills, demonstrates commitment, encourages team members and resolves conflicts*
Teaches Others		*Provides constructive feedback / reinforcement*
Serves Customers		*Analyzes customer needs, obtains additional resources to meet needs, and resolves conflicts to customer's satisfaction*
Exhibits Leadership		*Leads by example, demonstrates commitment to excellence and motivates others to extend their capabilities*
Negotiates Agreements		*Moderates discussion, demonstrates composure, and interprets concerns*
Works with Diversity		*Demonstrates awareness of diversity*
Understanding and Management of Systems		
Understands System		*Understands the system/hierarchy and follows processes and procedures*
Monitors/Corrects System Performance		*Monitors system performance and analyzes system operation*
Improves/Designs Systems		*Suggests system improvements and analyzes goals / constraints*
Use of Technology		
Selects Appropriate Technology		*Analyzes task / technology relationship and proposes simple technological solutions*
Applies Technology to Task		*Examines task / technology relationship and analyzes technology output*
Maintains/Troubleshoots Technology		*Identifies, troubleshoots and corrects malfunctions and analyzes failures*


WARNING

Turf Management Technician

HISTORIC DACUM CHART FOR TURF MANAGEMENT TECHNICIAN

Focus Panel Members
Gerald J. Anhorn, Irrigation Concepts, Inc.
Gene Jacobson, Walla Walla College
Jeff Blanc, Walla Walla Country Club
Tim Werner, City of Walla Walla Parks Department
Claudia Scott, Walla Walla Community College

COMPETENCY PROFILE OF TURF PROFESSIONAL

Duties: A. TURF MANAGEMENT

Tasks:

A1. Monitor weather	A2. Visually assess field conditions	A3. Utilize appropriate mowing techniques	A4. Operate Equipment as needed (See Equipment List)	A5. Perform specialized duties as required (i.e. sport, golf, park)	A6. Assess water needs	A7. Identify plant and soil fertility needs	A8. Select fertilizer
A9. Calibrate fertilizer	A10. Apply fertilizer	A11. Identify pests	A12. Control vehicle traffic	A13. Perform top dressing	A14. Perform aerofying	A15. Perform vertical mowing	A16. Perform over-seeding
A17. Perform sodding							

Duties: B. IRRIGATION SYSTEMS

Tasks:

B1. Calculate run times/ water use	B2. Schedule controller program	B3. Perform supplemental watering as required	B4. Perform pipe fitting	B5. Troubleshoot and repair controllers	B6. Troubleshoot and repair valves	B7. Troubleshoot and repair sprinkler heads	B8. Maintain pumps and equipment
B9. Install irrigation systems / components	B10. Shut-down irrigation system (winterization)	B11. Start-up irrigation system					

Duties: C. EQUIPMENT MAINTENANCE						
Tasks:						
C1. Inspect equipment for operation readiness	C2. Adjusts equipment	C3. Clean equipment after use	C4. Lubricate equipment	C5. Conduct preventative maintenance	C6. Sharpen mowers	C7. Repair or rebuild cutting units

Duties: D. LANDSCAPE MAINTENANCE							
Tasks:							
D1. Maintain planting beds (bark, weeds, etc.)	D2. Maintain trees shrubs (trim, prune, fertilize)	D3. Plant flowers	D4. Dispose of "green"waste (compost, burn, or other alternatives)	D5. Repair drainage systems	D6. Manage and maintain lakes and ponds	D7. Remove garbage	D8. Maintain sand traps
D-9. Apply proper ice/ snow removal techniques							

Duties: E. PESTICIDE MANAGEMENT						
Tasks:						
E1. Select proper pesticide	E2. Calibrate application equipment	E3. Perform proper pesticide handling procedures (store, mix, handle)	E4. Post pesticide use	E5. Apply pesticides	E6. Follow legal cleaning procedures on pesticide equipment	E7. Record pesticide applications

Duties: F. SAFETY				
Tasks:				
F1. Read/ follow manufacturers' operator safety manual	F2. Utilize safety equipment	F3. Adhere to safety policies	F4. Observe MSDS safety information	F5. Obtain and maintain first-aid and CPR certification

Duties: G. LANDSCAPE CONSTRUCTION							
Tasks:							
G1. Estimate construction costs	G2. Evaluate and follow site plan (irr., landscape)	G3. Obtain / purchase materials	G4. Plant trees and shrubs	G5. Prepare seed beds / seeding	G6. Install drainage systems	G7. Draw "as built" plans	G8. Build retaining wall/ fencing
G9. Construct ponds, lakes, and water traps	G10. Prepare, pour, finish & maintain concrete / asphalt						

Duties: H. ADMINISTRATIVE & SUPERVISORY DUTIES					
Tasks:					
H1. Adhere to environ-mental regulations	H2. Operate within given budgetary guidelines	H3. Train co-workers to operate equipment	H4. Perform assigned record keeping functions	H5. Perform assigned time keeping functions	H6. Follow purchasing procedures

SKILL STANDARDS TEMPLATE A

Summary of Functions & Tasks for Turf Mangement Technician

Skills Standards Templates A & B For Turf Management Technician

Professional with extensive technical knowledge of plant science, soil science, landscape design, irrigation, equipment operation, and overall turf management.

Critical Work Function	Key Activity
A. Manage Turf	
	A1 Assess turf condition
	A2 Mow turf
	A3 Assess grass and plant water needs
	A4 Identify plant and soil fertility needs
	A5 Perform specialized duties such as controlling vehicle and foot traffic
	A6 Perform top dressing and aerate turf
	A7 Overseed turf
	A8 Place sod
	A9 Perform vertical mowing
	A10 Water and fertilize turf
B. Install & Maintain Irrigation Systems	
	B1 Install irrigation components
	B2 Troubleshoot and repair controllers, valves and sprinkler heads
	B3 Maintain pumps and equipment
	B4 Install irrigation systems and/orcomponents
	B5 Shut-down irrigation system
	B6 Start-up irrigation system
C. Maintain Equipment	
	C1 Inspect for operation readiness
	C2 Perform cutting unit adjustments
	C3 Perform post operation maintenance
	C4 Supervise preventative maintenance
	C5 Supervise cutting unit sharpening
	C6 Supervise repair or rebuild of cutting units
D. Maintain Landscape	
	D1 Plant Flowers
	D2 Maintain flower and shrub beds
	D3 Maintain trees and shrubs
E. Manage Pesticides	
	E1 Identify pest problem(s)
	E2 Determine pest control method and select pesticide
	E3 Apply pesticide

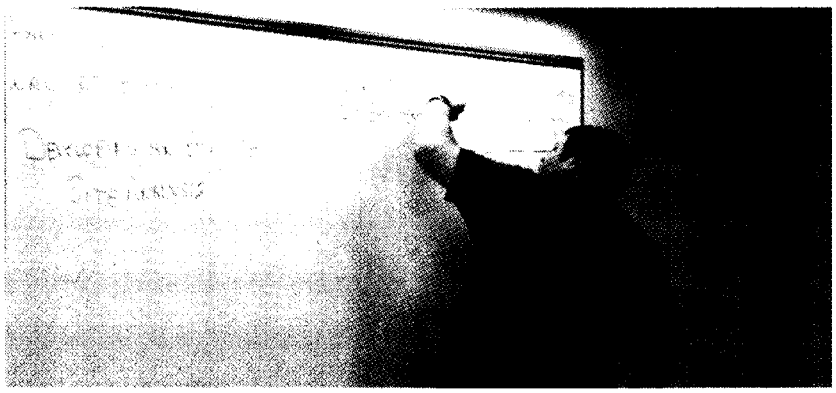
F. Construct Landscapes

F1 Develop a site plan
F2 Prepare site for landscape construction
F3 Construct landscape
F4 Obtain plant materials
F5 Plant trees and shrubs
F6 Draw as-built plan

G. Perform Administrative Duties

G1 Perform budgetary functions
G2 Train co-workers to operate equipment
G3 Perform record-keeping functions
G4 Purchase materials and supplies
G5 Supervise staff

TURF MANAGEMENT TECHNICIAN SKILL STANDARDS TEMPLATE B



Critical Work Function A: MANAGE TURF

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
A1. Assess turf condition	• Condition of turf is continuously and accurately assessed regarding playability and safety. • Condition of turf is continuously and accurately monitored including: plant health, moisture content, and potential or existing problems.	• Knowledge of weather conditions and their affect on the moisture content and health of grass plant. • Knowledge of turf grass plant water needs in various climatic and use situations. • Ability to recognize and identify indicators relating to plant health, moisture content, and potential or existing problems. • Ability to recognize and identify indicators relating to turf safety and playability to define potential or existing problems.	• Ability to obtain, analyze and integrate multiple items of relevant data. • Ability to recognize patterns and relationships. • Ability to generate solutions. • Ability to implement and adjust plan of action. • Ability to exhibit commitment to organization and ensure work quality.

Critical Work Function A: MANAGE TURF

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
A2. Mow turf	• Turf is cut to promote playability and is aesthetically pleasing in appearance. • Turf is cut following an appropriate schedule. • Designated mowing pattern is followed. • Designated mowing route is followed. • Clippings are disposed of properly when necessary. • Mowing equipment is operated following all safety guidelines.	• Ability to select and operate appropriate mowing equipment for the site. • Knowledge of, and ability to perform, various mowing patterns. • Knowledge of the importance of following a designated mowing route. • Knowledge of the environmental considerations of clipping disposal. • Knowledge of safety guidelines.	• Ability to follow a predetermined schedule. • Ability to work with minimal supervision. • Ability to pay attention to details. • Ability to accept responsibility for one's own work performance. • Ability to perform tasks and adjust schedule as required by supervisor. • Ability to follow proper procedures.
A3. Assess grass and plant water needs	• Current water needs are accurately determined. • Moisture content of soil and grass plant is continuously and accurately monitored. • Area climatic conditions are accurately assessed according to the time of year and needs of the grass plant.	• Ability to apply various methods of determining current soil and grass plant moisture content. • Knowledge of weather conditions and their affect on the moisture content of soil and grass plant. • Knowledge of various grass plants' water needs in various climatic and use situations. • Knowledge of visible signs and symptoms relating to grass plant moisture content and potential or existing problems. • Ability to recognize and identify indicators relating to grass plant moisture content and potential or existing problems.	• Ability to obtain, analyze and integrate multiple items of relevant data. • Ability to recognize patterns and relationships. • Ability to generate solutions. • Ability to implement and adjust plan of action. • Ability to exhibit commitment to organization and ensure work quality.

Critical Work Function A: MANAGE TURF

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
A4. Identify plant and soil fertility needs	• Current grass plant and soil fertility needs are accurately determined. • Fertility levels in the soil and grass plant are continuously and accurately monitored.	• Ability to apply various methods of determining current soil and grass plant fertility levels. • Knowledge of various grass plants' fertility needs in various climatic and use situations. • Ability to recognize and identify signs and symptoms relating to grass plant fertility levels and related potential or existing problems.	• Ability to obtain, analyze and integrate multiple items of data. • Ability to recognize patterns and relationships. • Ability to generate solutions. • Ability to implement and adjust plan of action. • Ability to exhibit and ensure work quality.
A5. Perform specialized duties such as controlling vehicle and foot traffic	• Golf course set up is performed according to supervisor's direction and quality standards. • Sand bunkers are maintained according to supervisor's direction and standards. • Restrooms are maintained in accordance with supervisor's direction and standards. • Sport fields are maintained in accordance with supervisor's direction and standards. • Vehicle and foot traffic on turf is controlled to prevent damage. • Turf is monitored for signs of vehicle and foot traffic wear. • Vehicle and foot traffic on turf is controlled to promote playability.	• Knowledge of the game of golf and other games played on sport fields, and their rules. • Ability to place pin locations and tee markers, repair ball marks on greens, and operate sand bunker maintenance equipment. • Knowledge of the methods used in sand bunker maintenance. • Knowledge of hazards associated with blood borne pathogens. • Knowledge of safety procedures required when using cleaning agents. • Ability to locate resources relating to the field setup of various games. • Knowledge of the relationship between field setup and player safety. • Ability to identify various types of damage caused by vehicle and foot traffic and knowledge of various methods used to control and minimize vehicle and foot traffic damage or interference.	• Ability to interpret and clarify communication. • Ability to gather information and apply rules/principles to situation. • Ability to pay attention to details and work with minimal supervision. • Ability to perform given set of tasks, adjust schedule, and efficiently manage time. • Ability to examine situation, analyze possible causes and recommend action plan. • Ability to visually analyze relationships between parts/whole, process/ procedure. • Ability to demonstrate commitment to customers and relate to customer concerns.

Critical Work Function A: MANAGE TURF

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
A6. Perform top dressing and aerate turf	• Top dressing is applied evenly and at the predetermined amount. • Top dressing is performed as needed for optimum turf health • Top dressing is performed during a time that does not interfere with turf use. • Turf aeration is performed as needed for optimum turf health. • Turf aeration is performed during a time that does not interfere with turf use.	• Knowledge of how and why top dressing and the aeration process benefit the turf. • Knowledge of the methods used to top dress turf. • Ability to apply top dressing techniques and to operate top dressing equipment. • Knowledge of turf use patterns. • Ability to assess turf and recognize when top dressing and/or aeration would be beneficial. • Knowledge of the methods used to aerate turf and the ability to operate aeration equipment.	• Ability to develop creative solutions. • Ability to demonstrate commitment to customers and relate to customer concerns. • Ability to understand requirements of the task and perform simple technological solutions. • Ability to demonstrate commitment to customers and relate to customer concerns. • Ability to analyze situation and develop plan of action. • Ability to understand requirements of the task and perform simple technological solutions.
A7. Overseed turf	• Overseeding is performed as needed for optimum turf health and density. • Overseeding is performed during a time that minimizes interference with turf use.	• Knowledge of how/why over-seeding process benefits the turf. • Ability to assess turf and recognize when overseeding would be beneficial. • Ability to utilize overseeding techniques. • Ability to operate overseeding equipment. • Knowledge of turf types.	• Ability to demonstrate commitment to customers and relate to customer concerns. • Ability to analyze situation and develop plan of action. • Ability to understand requirements of the task and perform simple technological solutions.

Critical Work Function A: MANAGE TURF

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
A8. Place sod	• Site is properly prepared for placing sod. • Selected sod is placed as needed for turf establishment or repair. • Appropriate post-sod placement care is performed to ensure healthy turf.	• Knowledge of, and ability to perform, site preparation principles for placing sod. • Knowledge of potential vendors for the purchase of quality sod. • Knowledge of turf types used in sod production and ability to select appropriate type for the site. • Ability to place sod correctly. • Knowledge of care required to ensure healthy sod.	• Ability to demonstrate commitment to customers and relate to customer concerns. • Ability to analyze situation and develop plan of action. • Ability to understand requirements of the task and perform simple technological solutions. • Ability to apply self-management skills.
A9. Perform vertical mowing	• Vertical mowing is performed as needed for optimum turf health and playability. • Vertical mowing is performed during a time that does not interfere with turf use.	• Knowledge of how and why the vertical mowing process benefits the turf. • Ability to assess turf and recognize when vertical mowing would be beneficial. • Ability to utilize vertical mowing techniques. • Ability to operate vertical mowing equipment. • Knowledge of turf use patterns.	• Ability to demonstrate commitment to customers and relate to customer concerns. • Ability to analyze situation and develop plan of action. • Ability to understand requirements of the task and perform simple technological solutions.

Critical Work Function A: MANAGE TURF

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
A10. Water and fertilize turf	• Irrigation schedule is developed according to area climatic conditions, time of year, and needs of the grass plant. • Adjustments are made to the irrigation schedule according to grass plants' water needs assessment. • Irrigation system is operated to provide appropriate amount of water for quality turf. • Supplemental watering is performed as needed. • Appropriate fertilizer is chosen to provide correct amount of selected nutrients. • Fertilizer schedule is developed according to area climatic conditions, time of year, and needs of the grass plant. • Adjustments are made to the fertilizer schedule according to grass plants' fertility needs assessment. • Turf is fertilized to provide appropriate amount of nutrients for quality turf.	• Ability to calculate sprinkler head precipitation rates when developing an irrigation schedule. • Knowledge of evapotranspiration rates and understanding of area climatic conditions and how they affect irrigation requirements. • Ability to determine when and how to provide supplemental watering and program and operate a variety of irrigation controllers. • Knowledge of different types of nitrogen and their solubility rates. • Knowledge of various grass plants' nitrogen consumption rates and of how grass plant cutting heights affect nitrogen use. • Ability to calculate yearly grass plant nutrient needs. • Ability to operate a variety of fertilizer application equipment and ability to calibrate fertilizer application equipment.	• Ability to follow instructions and identify relevant details, facts and specifications. • Ability to covert numerical data. • Ability to analyze information and consider risks and implications. • Ability to understand operation and manipulate technology for desired results. • Ability to interpret information. • Ability to convert numerical data. • Ability to analyze information and consider risks and implications. • Ability to follow policies and procedures.

Critical Work Function B: INSTALL AND MAINTAIN IRRIGATION SYSTEMS

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
B1. Install irrigation components	• Installation of pipe, valves, and wire is installed at proper location and depth. • Pipe, valves, and wire are in proper operating condition in accordance to industry and government standards. • All work is performed in a timely manner in accordance with the installation schedule.	• Knowledge of and ability to locate manufacturers' specifications. • Knowledge of safe construction/excavating equipment operation. • Knowledge of irrigation components.	• Ability to apply principles to situation. • Ability to formulate plan of action. • Ability to manage timeline. • Ability to follow set of instructions. • Ability to read blueprints.
B2. Troubleshoot and repair controllers, valves and sprinkler heads	• All components are inspected for failure and repaired or replaced as needed. • All components are reassembled and system is operating properly.	• Knowledge of controller systems, irrigation valves, sprinkler heads, their components and their relationship to each other. • Ability to test components and evaluate condition. • Knowledge of safety procedures. • Ability to safely and correctly use hand tools and electrical test equipment. • Ability to replace parts in an irrigated system. • Ability to locate and utilize appropriate reference material.	• Ability to gain information through research and follow technical manual guidelines. • Ability to make connections between old and new. • Ability to analyze component wear, damage, failure and determine causes. • Ability to analyze information and solutions. • Ability to perform technological solutions and determine repair procedures. • Ability to follow safety procedures. • Ability to correct malfunctions.

Critical Work Function B: INSTALL AND MAINTAIN IRRIGATION SYSTEMS

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
B3. Maintain pumps and equipment	• Maintenance schedule is developed and followed. • Maintenance tasks are performed according to industry standards. • Hazardous materials are stored/disposed of properly. • Maintenance work is properly documented.	• Knowledge of pumps and irrigation components used in a system. • Knowledge of system operations. • Ability to use hand tools safely and correctly. • Knowledge of hazardous material regulations.	• Ability to read technical manuals. • Ability to follow set of instructions. • Ability to perform a given set of tasks. • Ability to use materials in a safe and efficient manner. • Ability to complete record forms. • Ability to maintain maintenance logs.
B4. Install irrigation systems and/or components	• Pipe, valves, and wire are installed at proper location and depth. • Pipe, valves, and wire are in proper operating condition in accordance to industry standards. • All work is performed in a timely manner in accordance with the installation schedule.	• Knowledge of and ability to locate manufacturer's specifications. • Knowledge of safe construction/excavating equipment operation. • Knowledge of irrigation components.	• Ability to present basic ideas and information. • Ability to apply principles to situation. • Ability to read blueprints. • Ability to formulate plan of action. • Ability to monitor work performance. • Ability to manage timeline. • Ability to follow set of instructions.
B5. Shut-down irrigation system	• System is winterized according to established procedures. • All components are inspected and evaluated. • Any necessary repairs are made to the system.	• Ability to locate appropriate reference material. • Knowledge of irrigation components. • Knowledge of irrigation system layout. • Ability to evaluate irrigation components. • Ability to use hand tools safely and correctly. • Ability to operate air compressor.	• Ability to follow a set of instructions. • Ability to understand the operation of the system. • Ability to perform an assigned task. • Knowledge of water hydraulics.

Critical Work Function B: INSTALL AND MAINTAIN IRRIGATION SYSTEMS

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
B6. Start-up irrigation system	• System is started according to established procedures. • All components are inspected and evaluated. • Any necessary repairs are made to the system.	• Ability to locate appropriate reference material. • Knowledge of irrigation components. • Knowledge of irrigation system layout. • Ability to evaluate irrigation components. • Ability to use meters and gauges to determine proper adjustment levels. • Ability to use hand tools safely and correctly.	• Ability to follow a set of instructions. • Ability to understand the operation of the system. • Ability to perform an assigned task. • Knowledge of water hydraulics.

Critical Work Function C: MAINTAIN EQUIPMENT

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
C1. Inspect for operation readiness	• Equipment is thoroughly examined and any fluid leaks are located. • All fluids are at appropriate level for operation. • Cutting surfaces are inspected for proper adjustment and/or sharpness for optimum cutting performance. • Safety procedures are followed when inspecting equipment.	• Knowledge of basic turf equipment engine mechanics, including hydraulic systems. • Ability to select appropriate fluids for use in turf equipment. • Ability to assess rotary blades for proper sharpness. • Ability to check and identify proper reel-to-bedknife adjustment. • Knowledge of safety procedures involved in equipment inspection and operation readiness.	• Ability to visually analyze relationship between parts/whole, process/ procedure. • Ability to identify problem. • Ability to prioritize tasks and adjust task sequence.
C2. Perform cutting unit adjustments	• Reel-to-bedknife adjustment is accurately performed. • Safety procedures are followed when performing cutting unit adjustments.	• Knowledge of the reel-to-bedknife relationship. • Knowledge of the importance of accurate reel-to-bedknife adjustments and its affect on cutting unit performance. • Ability to accurately perform reel-to-bedknife adjustments. • Knowledge of safety procedures involved with performing cutting unit adjustments.	• Ability to understand technology applications and follow proper procedures. • Ability to apply principles to situation. • Ability to identify problem. • Ability to ensure work quality.
C3. Perform post operation maintenance	• Post operation maintenance is consistently followed including washing, refueling, and cutting unit lubrication. • Equipment is returned to its proper storage location.	• Knowledge of shop fundamentals. • Knowledge of supervisor's expectations related to the proper care and storage of equipment. • Ability to lubricate equipment.	• Ability to understand technology applications and follow proper procedures. • Ability to apply principles to situation. • Ability to identify problem. • Ability to ensure work quality.

Critical Work Function C: MAINTAIN EQUIPMENT

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
C4. Supervise preventive maintenance	• Preventive maintenance on equipment is properly and correctly performed on a scheduled basis.	• Knowledge of tasks involved in preventative maintenance. • Knowledge of appropriate timing intervals between maintenance tasks. • Ability to recognize when maintenance tasks have been completed.	• Ability to present basic information, explain concepts, and actively participate in discussion. • Ability to assess individual knowledge/skill and monitor performance. • Ability to demonstrate commitment to excellence and lead by example. • Ability to evaluate performance of technology and analyze failures.
C5. Supervise cutting unit sharpening	• Cutting units are sharpened on a regular basis as needed. • Reels and bed knives are backlapped on a regular basis as needed.	• Knowledge of tasks involved in sharpening cutting units. • Knowledge of tasks involved in backlapping reels and bed knives. • Ability to assess cutting units for sharpness.	• Ability to present basic information, explain concepts, and actively participate in discussion. • Ability to assess individual knowledge/skill and monitor performance. • Ability to demonstrate commitment to excellence and lead by example. • Ability to evaluate performance of technology and analyze failures
C6. Supervise repair or rebuild of cutting units	• Cutting units are properly repaired when necessary. • Cutting units are rebuilt on a scheduled basis as needed.	• Ability to assess cutting unit performance and coordinate all necessary repairs and rebuilds. • Understanding of basic turf equipment cutting unit mechanics.	• Ability to present basic information, explain concepts and actively participate in discussion. • Ability to assess individual knowledge/skill and monitor performance. • Ability to demonstrate commitment to excellence and lead by example. • Ability to evaluate performance of technology and analyze failures.

Critical Work Function D: MAINTAIN LANDSCAPE

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
D1. Plant flowers	• Flowers planted are appropriate for their environment (climate, sun/ shade, and soil). • Flowers are planted in an aesthetically planned arrangement. • Flowers are planted in a manner that minimizes distress to the plant. • Flowers are planted using procedures that maximize plant's growing potential.	• Knowledge of available annuals and perennials that are suitable for select environments (soil, shade/ sun, climate, season, etc.). • Knowledge of soil types, structures, and textures. • Knowledge of and ability to apply basic landscape design principles. • Knowledge of planting techniques and appropriate soil enhancements.	• Ability to gather information and predict results based on experience or prior knowledge. • Ability to visualize design and concept. • Ability to exert effort and perseverance to ensure work quality. • Ability to follow-up on assigned tasks.
D2. Maintain flower and shrub beds	• Beds are free of weeds and grasses. • Beds are aesthetically pleasing.	• Understanding of weed and grass control methods. • Ability to apply pesticides. • Knowledge of and ability to apply basic landscape design principles. • Knowledge of various mulching materials. • Ability to select and properly place appropriate mulching materials.	• Ability to gather information and predict results based on experience or prior knowledge. • Ability to visualize design and concept. • Ability to exert effort and perseverance to ensure work quality. • Ability to follow-up on tasks.

Critical Work Function D: MAINTAIN LANDSCAPE

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
D3. Maintain trees and shrubs	• Visual inspection of trees and shrubs reveal no signs of stress. • Trees and shrubs are properly pruned. • Trees and shrubs are healthy as a result of proper fertilization, watering and pest control management. • Pruning and trimming debris is disposed properly.	• Ability to identify signs and symptoms of stress in trees and shrubs. • Knowledge of and ability to apply proper pruning techniques and use pruning tools. • Ability to apply fertilizers used to maintain good health in trees and shrubs. • Ability to apply proper watering techniques to maintain good health in trees and shrubs. • Ability to apply proper pest control methods to maintain good health in trees and shrubs. • Knowledge of state and local regulations regarding the disposal of pruning and trimming debris.	• Ability to visually analyze and identify problem. • Ability to follow policies and procedures. • Ability to understand operation and manipulate technology for desired results. • Ability to exert effort and perseverance to ensure work quality. • Ability to follow-up on assigned tasks. • Ability to visualize design and concept.

Critical Work Function E. MANAGE PESTICIDES

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
E1. Identify pest problem(s)	• Existing pest problems are correctly identified. • Potential pest problems are correctly identified.	• Knowledge of turf and ornamental weed management principles. • Ability to identify weeds by sight and classification. • Knowledge of turf and ornamental insect management principles. • Ability to identify insects by sight and by related damage. • Knowledge of turf and ornamental diseases. • Ability to identify turf and ornamental diseases by sight. • Ability to identify conditions conducive to specific disease development.	• Ability to examine information, analyze possible causes, and plan action. • Ability to visually analyze relationship between parts/whole, process/ procedure. • Ability to research additional information sources.
E2. Determine pest control method and select pesticide.	• Method selected is appropriate for the problem and the site. • Cost vs. benefit of individual options is properly evaluated. • Environmental "costs" of method options are properly evaluated. • All available control methods are considered in the decision making process including physical, mechanical, cultural, and chemical. • Label on pesticide confirms that the selection is appropriate and legal.	• Knowledge of available control options. • Knowledge of the benefits and risks of available control options. • Knowledge of costs and manpower associated with available control options. • Knowledge of environmental impact of the available control options. • Knowledge of the equipment required to use each of the available control options. • Knowledge of pesticide formulations. • Knowledge of all current applicable pesticide laws.	• Ability to research to gain information. • Ability to evaluate solutions and formulate plan of action based on research, experience and prior knowledge. • Ability to adapt principles to new applications. • Ability to analyze task/ technology relationship. • Ability to read and understand pesticide labels. • Ability to operate within given budgetary guidelines.

Critical Work Function E. MANAGE PESTICIDES

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
E3. Apply pesticide	• Proper pesticide handling procedures are followed. • Application equipment is correctly calibrated. • Proper pesticide dosage is correctly determined, measured, and combined. • Acceptable environmental conditions for application are correctly determined. • The pesticide is correctly applied. • Equipment is properly cleaned after application. • Regulations regarding posting for pesticide applications are followed. • Regulations regarding pesticide record keeping are followed.	• Knowledge of "Worker Right to Know" principles. • Knowledge of first aid principles and toxicity and poisoning. • Ability to calibrate pesticide application equipment, and knowledge of proper equipment cleaning methods. • Ability to calculate area measurements. • Understanding of safety precautions and regulations related to handling, storage, and disposal of pesticides and pesticide containers. • Knowledge of all current, applicable pesticide laws.	• Ability to follow written set of instructions, interpret information, and identify relevant details, facts and specifications. • Ability to convert numerical data. • Ability to use and maintain materials in a safe and efficient manner. • Ability to understand operation and manipulate technology for desired results. • Ability to gather information and apply rules to situation. • Ability to follow proper procedures. • Ability to read and understand pesticide labels.

Critical Work Function F: CONSTRUCT LANDSCAPE

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
F1. Develop a site plan	• Selected site is evaluated in preparation for landscape plan including topography and environmental conditions. • Selected site is accurately measured and neatly drawn to scale. • Customer needs and resources are solicited, assessed, and incorporated into the site plan. • Total construction costs are accurately estimated and included in the site plan. • Site plan is neat and concise and is professionally presented to the customer for approval.	• Knowledge of topography and environ-ment in relation to proper landscape design and site plan. • Ability to utilize site measurement equipment and knowledge of architectural scales. • Knowledge of methods used to incorporate customer's needs and resources. • Knowledge of time requirements for various construction tasks. • Knowledge of landscape construction materials available and of supply and material costs. • Ability to produce a neat, concise site plan and present finished site plan for customer approval.	• Ability to analyze communication and relate intent to desired results. • Ability to perform measurements and convert numerical data. • Ability to analyze customer needs and demonstrate commitment to customer. • Ability to identify future material needs and assess quality, efficiency and safety. • Ability to present complex ideas and information. • Ability to accurately measure and draw to scale.
F2. Prepare site for landscape construction	• Site is accurately rough-graded according to site plan. • Drainage is properly installed on the site. • Irrigation is properly installed on the site.	• Ability to read site plans and determine required steps for rough grading. • Ability to operate a small front loader such as a Bobcat. • Ability to achieve desired results through proper use of hand tools. • Knowledge of criteria for proper drainage (i.e.; need, type, amount). • Ability to install various types of drainage systems and irrigation system as specified in the site plan. • Ability to use tools and techniques commonly used in irrigation installation.	• Ability to read and follow set of instructions and identify relevant details, facts, and specification. • Ability to work with minimal supervision and pay attention to details. • Ability to efficiently manage time in performing given set of tasks. • Ability to acquire supplies and equipment. • Ability to follow proper procedures in the operation of equipment.

Critical Work Function F: CONSTRUCT LANDSCAPE

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
F3. Construct landscape	• Retaining walls and fencing (if applicable) are properly constructed. • Ponds and water features (if applicable) are properly constructed. • Concrete patios or walkways are properly constructed. • Seedbeds are properly prepared for planting. • Turf areas are properly planted.	• Knowledge of site preparation requirements for retaining walls, fencing, water features, decks, patios, and walkways and the ability to prepare a site for retaining walls and fencing according to site plan specifications. • Knowledge of the materials commonly used for retaining walls or fencing. • Ability to apply proper construction methods for retaining walls, fencing, water features, decks, patios, and walkways. • Knowledge of, and ability to apply, the steps used in poring and finishing concrete and ability to use concrete finishing tools. • Knowledge of site preparation required for seed or sod beds, and ability to prepare site for seed or sod including: till, finish grade, rake, roll, addition of soil amendments, etc. • Knowledge of and ability to apply seeding techniques, and ability to lay sod.	• Ability to apply principles to situation. • Ability to interpret site plans and visually analyze relationship between parts/whole, process/ procedure. • Ability to work with minimal supervision and pay attention to details. • Ability to demonstrate enthusiasm and initiative. • Ability to prepare schedule, prioritize daily tasks and monitor/adjust task sequence.

Critical Work Function F: CONSTRUCT LANDSCAPE

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
F4. Obtain plant materials	• Planting materials are selected according to the site plan. • Planting materials are purchased from the vendor who best matches cost/ quality specifications.	• Ability to read and follow site plan. • Ability to differentiate between high and low quality planting materials. • Knowledge of potential vendors for the purchase of plant materials. • Knowledge of cost range in relation to quality of plant materials.	• Ability to identify relevant details and follow set of instructions. • Ability to research information and additional sources. • Ability to participate in negotiation process and communicate appropriate verbal messages. • Ability to perform basic computations.
F5. Plant trees and shrubs	• Trees and shrubs planted are appropriate for environment (climate, sun/shade, and soil). • Trees and shrubs are planted in an aesthetically planned arrangement following acceptable design and location criteria. • Trees and shrubs are planted in a manner that minimizes distress to the plant. • Trees and shrubs are planted using procedures that maximize their growing potential. • Trees and shrubs are planted in a location that minimizes potential damage to the surrounding area by roots, branches, etc.	• Knowledge of available trees and shrubs that are suitable for select environments. (soil, shade/sun, climate, season, etc.). • Knowledge of soil types, structures, and textures. • Knowledge of and ability to apply basic landscape design principles. • Knowledge of planting techniques and appropriate soil enhancements. • Knowledge of tree and shrub growth patterns relating to future size, shape, and location around structures. • Knowledge of potential damage tree roots and branches can cause. • Ability to use various tools used for planting trees and shrubs.	• Ability to gather information and predict results based on experience or prior knowledge. • Ability to visualize design and concept. • Ability to exert effort and perseverance to ensure work quality. • Ability to follow up on assigned tasks. • Ability to assess quality of materials and use in an efficient manner.
F6. Draw as-built plan	• Final plan is drawn that accurately reflects the finished construction site. • Final plan is distributed to all necessary parties.	• Ability to accurately draw finished construction site plan to scale. • Ability to identify site plan recipients.	• Ability to create original documents. • Ability to design charts/ graphs. • Ability to follow-up on assigned tasks. • Ability to justify purpose/ results.

Critical Work Function G: PERFORM ADMINISTRATIVE DUTIES

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
G1. Perform budgetary functions	• Information in budget is accurate, complete, and appropriate by line item. • Total budget is within designated limits. • Final budget is presented to supervisor for approval. • Budget is continuously monitored throughout the fiscal period and remains within guidelines.	• Ability to read and interpret budget printouts. • Knowledge of line item expenditures and ability to prioritize expenditures. • Knowledge of budgetary codes and ability to categorize expenditures.	• Ability to manipulate and organize mathematical data. • Ability to propose options based on research/ planning. • Ability to research past expenditures and gather input from other employees. • Ability to generate and evaluate alternative solutions. • Ability to present and justify budget to supervisor. • Ability to develop budget proposals and monitor multiple accounts. • Ability to design new organizational systems. • Ability to record information accurately and neatly.
G2. Train co-workers to operate equipment	• Training programs adequately train employees for a variety of jobs. • Training programs adequately train employees to operate a variety of equipment • Safety procedures are followed when operating equipment.	• Knowledge of the various tasks performed at the site. • Ability to operate various turf equipment. • Knowledge of safety hazards and precautions related to mowing equipment.	• Ability to communicate appropriate verbal information, including detailed instructions. • Ability to establish rapport with co-workers and willingness to help others. • Ability to coach others to apply related concepts and facilitate the learning process. • Ability to value diversity and work to remove barriers.

Critical Work Function G: PERFORM ADMINISTRATIVE DUTIES

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
G3. Perform record-keeping functions	• Personnel records are accurately maintained. • Employee time keeping records are accurately maintained. • Pesticide records are maintained to government and industry standards.	• Knowledge of contents and structure of personnel, time keeping, and pesticide records. • Knowledge of governmental pesticide record keeping regulations.	• Ability to record information accurately. • Ability to perform routine record keeping functions. • Ability to perform data entry and understand computer operation.
G4. Purchase materials and supplies	• Inventory of materials and supplies needed for operation is maintained. • Materials and supplies purchased for inventory are of desired quality. • Purchasing records are accurately maintained. • Purchasing procedures are accurately followed. • Inventory records are accurate and up-to-date.	• Knowledge of vendor quality and service. • Knowledge of typical purchasing procedures. • Ability to utilize computer database and parts ordering software. • Knowledge of content and procedures for inventory records. • Knowledge of technical terminology and industry jargon.	• Ability to record information accurately. • Ability to communicate appropriate verbal information. • Ability to establish rapport with co-workers and clients. • Ability to perform routine record keeping and maintain balanced accounts. • Ability to identify future material needs. • Ability to perform data entry and understand computer operation.
G5. Supervise staff	• Productivity is maximized by effectively defining and delegating responsibility. • Daily and weekly plans are accurately developed and communicated to appropriate personnel. • Consistent and timely review process is maintained. • A productive mental and physical working environment is provided to motivate employees.	• Knowledge of the various tasks performed at the site. • Knowledge of company procedures for employee reviews. • Knowledge of the elements of a productive working environment in a turf management situation.	• Ability to communicate detailed instructions verbally and in meetings. • Ability to establish rapport with co-workers. • Ability to implement effective employee motivation techniques. • Ability to record information accurately. • Ability to monitor work performance. • Ability to coach others to apply related concepts and facilitate the learning process. • Ability to value diversity and work to remove barriers.

TURF MANAGEMENT TECHNICIAN SCENARIOS

The use of scenarios based on real life work situations provides a powerful contextual tool to assist the professional in this area of expertise in understanding and mastery of the necessary knowledge, skills, and abilities needed to work within this profession.

These three scenarios demonstrate how skill standards information can be directly applied to real workplace problems.

- **ROUTINE SCENARIO** – A typical situation that might occur during a typical day.

- **CRISIS SCENARIO** – A crisis situation that would challenge the individual to provide an appropriate and timely response.

- **LONG TERM PLANNING SCENARIO** – A long term planning situation.

For each scenario, relevant critical work functions and key activities involved in resolving the specific situations are identified. The key activities, knowledge skills and abilities necessary to approach and successfully resolve the specific work-related challenges may be referenced using the completed skill standards charts.

ROUTINE SCENARIO

Bill arrives at the golf course prior to the start of the day's activities. He reviews the planned daily activities with the staff including mowing, watering and course set up. Once the daily tasks have been delegated to staff and any questions and/or problems have been discussed, Bill goes out on the golf course to assess current conditions. Based on his assessments, Bill makes decisions and/or sets priorities regarding future maintenance activities.

Primary Key Activities and Critical Work Functions Involved in this Scenario:

A. Manage Turf
- A1. Monitor turf conditions
- A3. Assess grass and plant water needs
- A4. Identify plant and soil fertility needs

G. Perform Administrative Duties
- G5. Supervise staff

CRISIS SCENARIO

Bill is out on the golf course to assess current conditions. Upon arriving at 7 green, he finds spots of about 2 inches in diameter and of a dark brown color. He determines that the spots in question are a turf disease called *Fusarium Patch*. Bill knows if this turf disease is not quickly treated the spots will grow in size and kill the turf. Following a quick assessment of all other greens on the golf course, he determines the need to apply the appropriate fungicide to all greens. After selecting the proper fungicide and preparing the necessary application equipment, all greens are treated that day following the mowing route. All post-pesticide related tasks are followed.

Primary Key Activities and Critical Work Functions Involved in this Scenario:

A. Manage Turf
- A1. Assess turf conditions

E. Manage Pesticides
- E1. Identify pest problem(s)
- E2. Determine pest control method
- E3. Select proper pesticide
- E4. Apply pesticide

G. Perform Administrative Duties
- G3. Perform record keeping functions

LONG-TERM PLANNING

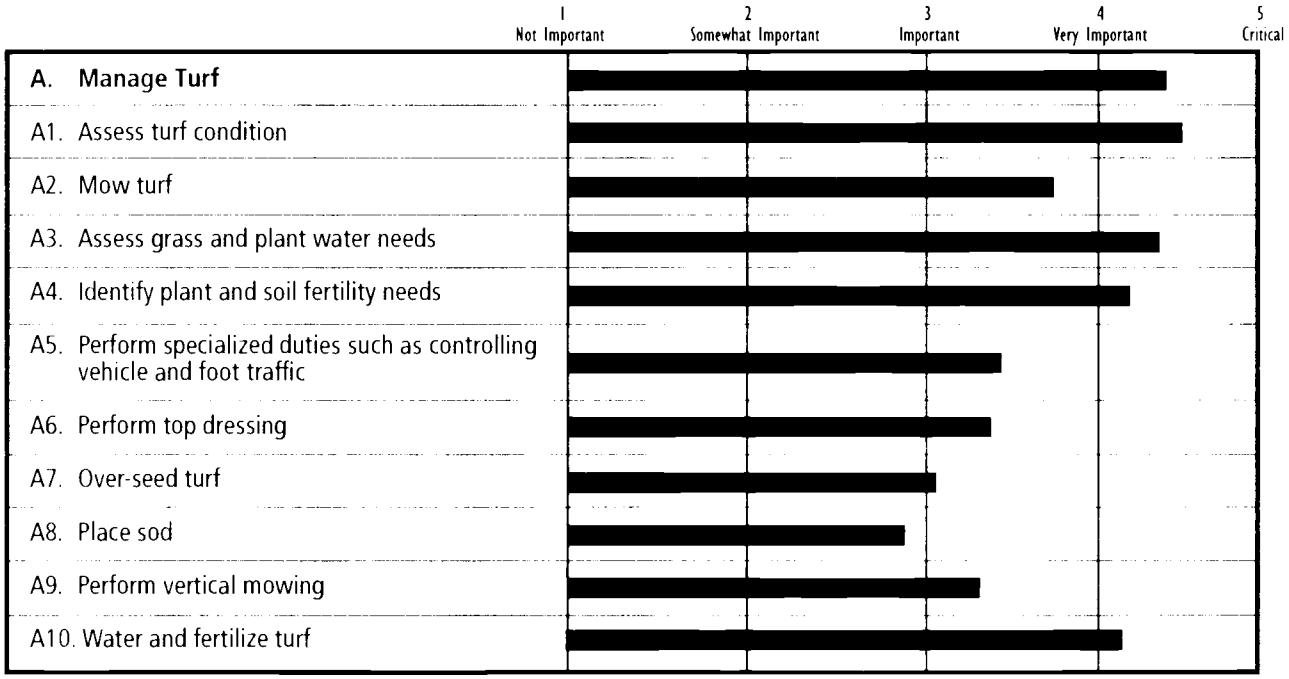
On a yearly basis, during late winter, Bill must formulate a plan for the hiring and work duration of seasonal workers. Bill must consider several factors as he plans for the coming year. These factors include: budget considerations, weather patterns, changes in daily work routines from previous years, special projects, and the yearly golf tournament schedule. Based on these factors, Bill formulates a plan for hiring an appropriate number of seasonal workers, the starting and ending employment dates for each worker and each worker's rate of pay.

Primary Key Activities and Critical Work Functions Involved in this Scenario:

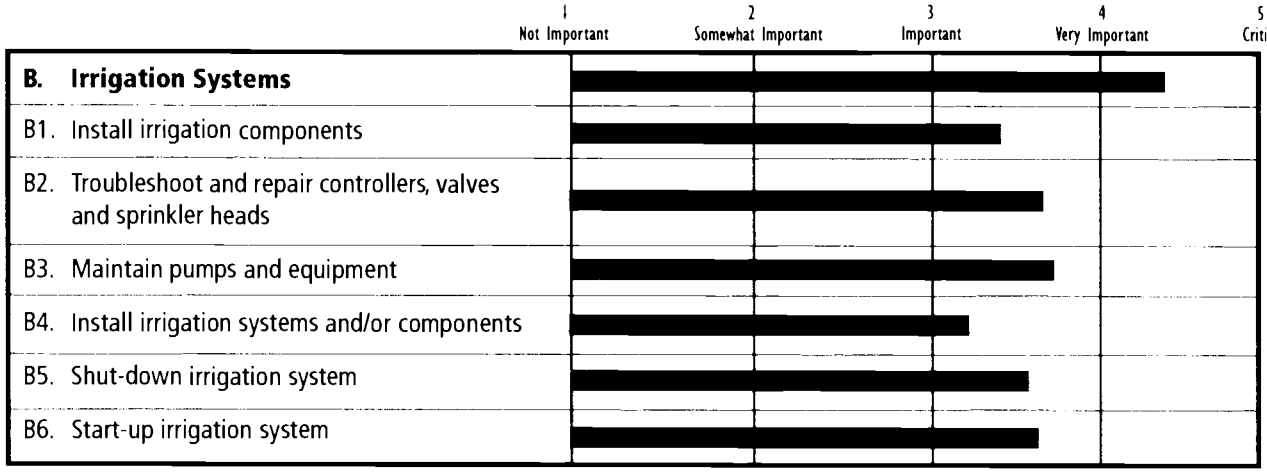
G. Perform Administrative Duties
- G1. Perform budgetary functions
- G4. Perform record-keeping functions

TURF MANAGEMENT TECHNICIAN VALIDATION SURVEY RESULTS

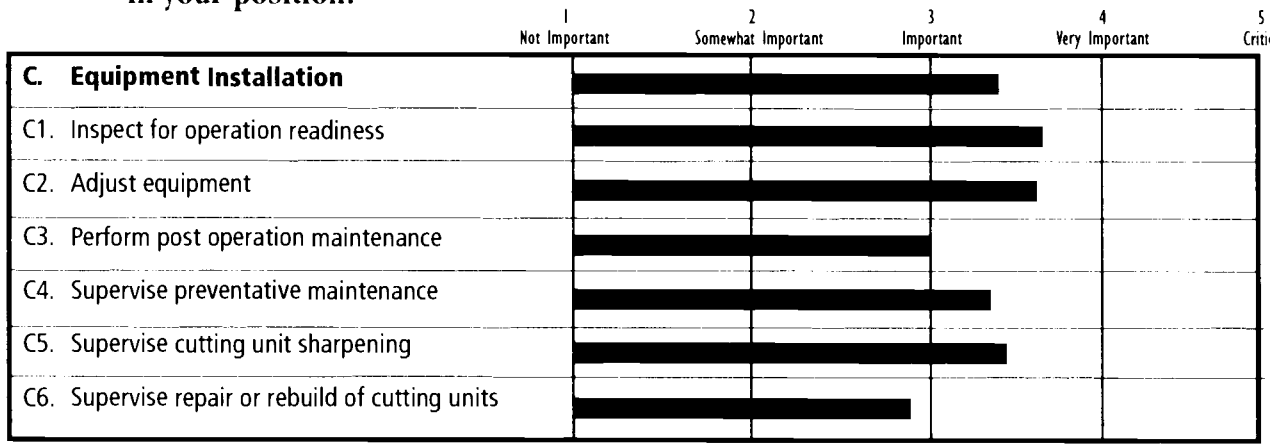
How important are these tasks in your position?



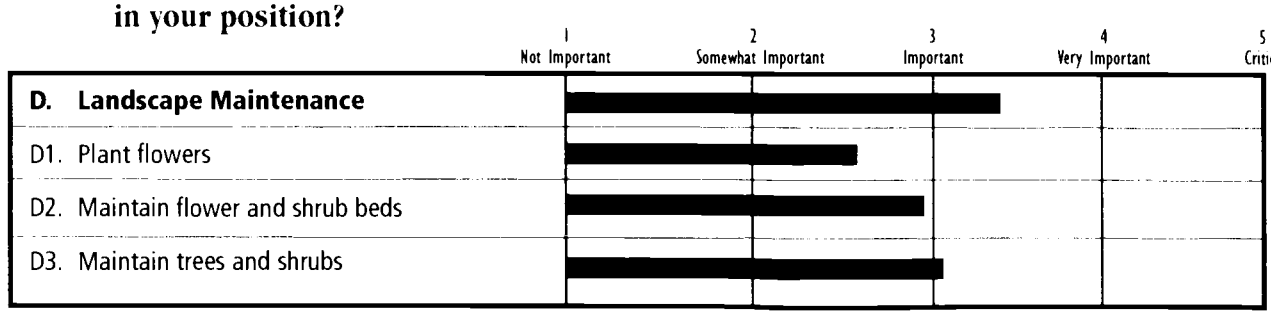
How important are these tasks in your position?



How important are these tasks in your position?



How important are these tasks in your position?



How important are these tasks in your position?

	1 Not Important	2 Somewhat Important	3 Important	4 Very Important	5 Critical
E. Manage Pesticide					
E1 Identify pest problem(s)					
E2 Determine pest control method and select pesticide					
E3. Apply pesticide					
E4. Follow post-pesticide application procedure					

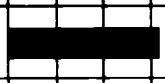
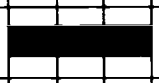
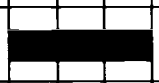
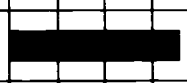
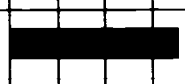
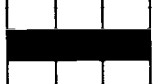
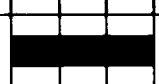
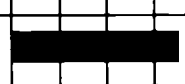
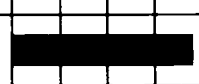
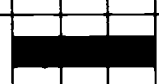
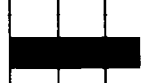
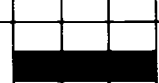
How important are these tasks in your position?

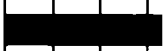
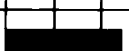
	1 Not Important	2 Somewhat Important	3 Important	4 Very Important	5 Critical
F. Landscape Construction					
F1. Develop a site plan					
F2. Prepare site for landscape construction					
F3. Construct landscape					
F4. Obtain plant materials					
F5. Plant trees and shrubs					

How important are these tasks in your position?

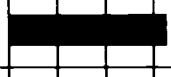
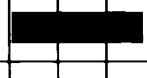
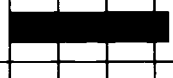
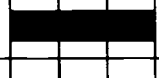
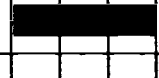
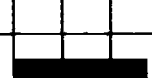
	1 Not Important	2 Somewhat Important	3 Important	4 Very Important	5 Critical
G. Perform Administrative Duties					
G1. Perform budgetary functions					
G2. Train co-workers to operate equipment					
G3. Perform record-keeping functions					
G4. Purchase materials and supplies					
G5. Supervise staff					

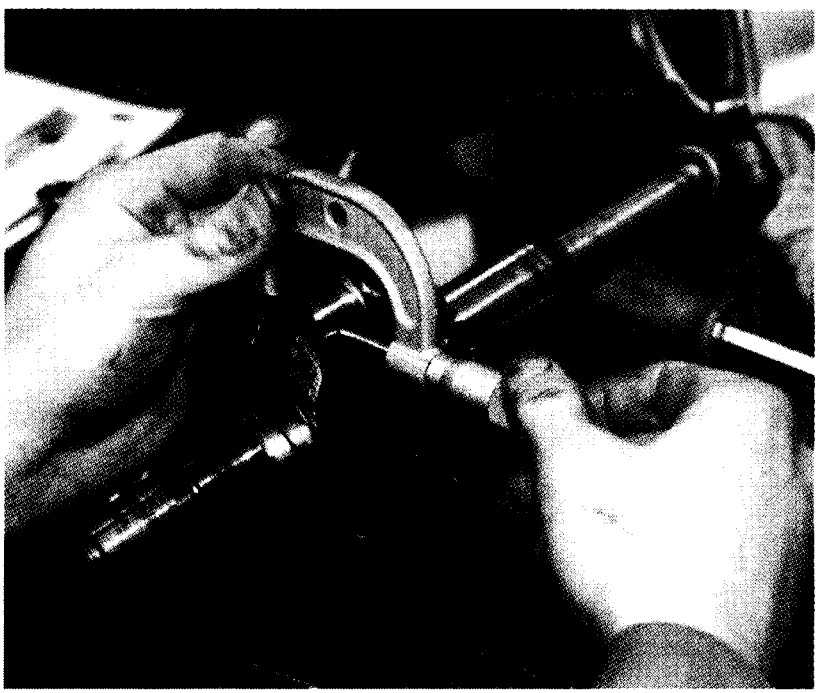
Turf Management Technician SCANS Skill Survey Results

Foundation Skills and Personal Qualities	0 1 2 3 4 5	Critical Competencies
Basic Skills		
Demonstrates Effective Reading Strategies		*Interprets, analyzes and summarizes information*
Demonstrates Effective Writing Strategies		*Composes correspondence and original documents and summarizes information*
Applies Arithmetic Processes		*Performs measurements and interprets numerical data and predicts arithmetic results*
Applies Mathematics Processes		*Manipulates formulas/process and interprets mathematical data*
Demonstrates Effective Listening Skills		*Interprets, clarifies, and influences communication and compares multiple viewpoints*
Demonstrates Effective Speaking Skills		*Presents complex ideas, analyzes group/individual response and poses critical questions*
Thinking Skills		
Applies Creative Thinking/ Generates Ideas		*Develops and applies creative solutions to new situations*
Applies Decision Making Strategies		*Analyzes situation and considers risks, implications, and multiple viewpoints and formulates plan of action*
Recognizes and Solves Problems		*Examines situation, analyzes possible causes and generates solutions*
Demonstrates Visualization		*Visually analyzes relationship between parts/whole and interprets symbols and pictures*
Knows How to Learn		*Interprets symbols, diagrams and schematics and applies new knowledge and experience*
Applies Reasoning Skills		*Analyzes rules/principles and examines information for relevance and accuracy*

Foundation Skills and Personal Qualities	0 1 2 3 4 5	Critical Competencies
Personal Qualities		
Demonstrates Responsibility		*Monitors performance standards and follows through on assigned tasks*
Demonstrates Belief in Self Worth		*Accepts responsibility for own behavior, understands impact on others and demonstrates self reliance and self discipline*
Demonstrates Sociability in Groups		*Modifies behavior to environment and shows empathy for others; encourages cooperation*
Demonstrates Self-Management		*Sets and adjusts goals, and demonstrates commitment to self improvement maintains self control*
Demonstrates Integrity/Honesty		*Analyzes personal/societal implications of actions and formulates ethical course*
Management of Time and Resources		
Manages Time		*Prepares schedule and prioritizes, monitors, and adjusts task*
Manages Money		*Maintains balanced accounts and reconciles accounts*
Manages Materials/Facilities		*Orders and maintains inventory and monitors safe and efficient utilization of materials*
Manages Human Resources		*Assesses individual skills, determines work load and monitors performance*
Management and Use of Information		
Acquires/Evaluates Information		*Analyzes data and integrates multiple items of data*
Organizes/Maintains Information		*Interprets information, applies processes to new information and analyzes organization of information*
Interprets/Communicates Information		*Interprets information, selects methods of communication and summarizes/integrates information*
Uses Computers to Process Information		*Utilizes integrated software, locates and retrieves stored information and interprets data*

Turf Management Technician SCANS Skill Survey Results

Foundation Skills and Personal Qualities	0 1 2 3 4 5	Critical Competencies
Interpersonal Skills		
Participates as Team Member		*Demonstrates commitment, works to improve team activities and assists team members*
Teaches Others		*Conducts task-specific training, coaches others and provides constructive feedback*
Serves Customers		*Analyzes customer needs, obtains additional resources to meet needs, makes exceptional effort on behalf of customer, and resolves conflicts to customer's satisfaction*
Exhibits Leadership		*Motivates others to extend their capabilities and displays enthusiasm*
Negotiates Agreements		*Moderates discussion, demonstrates composure, interprets concerns and detects underlying issues*
Works with Diversity		*Demonstrates awareness and value of diversity*
Understanding and Management of Systems		
Understands System		*Understands the system/hierarchy and follows processes and procedures*
Monitors/Corrects System Performance		*Adjusts and monitors system operation and troubleshoots system malfunction*
Improves/Designs Systems		*Analyzes goals, determines system components to be improved and suggests system modifications*
Use of Technology		
Selects Appropriate Technology		*Understands the requirements of the task and technological results and proposes simple technological solutions*
Applies Technology to Task		*Understands the operation/interaction, manipulates technology for desired results*
Maintains/Troubleshoots Technology		*Identifies, troubleshoots and corrects malfunctions*



Turf Equipment Service Technician

HISTORIC DACUM CHART FOR TURF EQUIPMENT SERVICE TECHNICIAN

Focus Panel Members
David Floe, Barnett Implement
Tim Werner, City of Walla Walla Parks Department
Brandon Meiners, Salem Country Club
Brian Brown, Barnett Implement
Bruce Zier, Walla Walla Country Club
Sam Doble, Meadow Spring Country Club

COMPETENCY PROFILE OF TURF EQUIPMENT SERVICE TECHNICIAN

Duties: A. MAINTAIN EQUIPMENT			
Tasks:			
A1. Read and follow factory recommended maintenance schedule	A2. Schedule and perform service according to operators manual	A3. Adjust equipment	A4. Maintain service log

Duties: B. MAINTAIN REEL / ROTARY				
Tasks:				
B1. Sharpen reel/bed knife	B2. Sharpen and balance blade	B3. Back-lap reels	B4. Balance rear roller and check height	B5. Adjust or replace bearings or reels

Duties: C. ENGINES (2 & 4-CYCLE, DIESEL)						
Tasks:						
C1. Read service/ technical manual	C2. Perform basic trouble shooting	C3. Tear down engine	C4. Evaluate repair vs. replace options	C5. Order parts (read parts manual)	C6. Reassemble engine	C7. Perform final adjustments and evaluate performance

Duties: D. HYDRAULIC POWER TRAINS					
Tasks:					
D1. Read service/ technical manual	D2. Perform basic trouble shooting	D3. Diagnose and repair clutch	D4. Evaluate repair vs. replace options	D5. Diagnose and repair brakes	D6. Diagnose and repair steering systems

Duties: E. ELECTRICAL							
Tasks:							
E1. Read service/ technical manual	E2. Troubleshoot safety switches	E3. Utilize testing equipment	E4. Diagnose electric motors	E5. Tear down electrical systems	E6. Evaluate repair vs. replace options	E7. Order parts (read parts manual)	E8. Reassemble electrical system
E9. Perform final adjustments & evaluate performance							

Duties: F. HYDRAULICS							
Tasks:							
F1. Read service/ technical manual	F2. Follow hydraulic safety protocol	F3. Perform basic trouble shooting	F4. Utilize testing equipment	F5. Tear down hydraulics	F6. Evaluate repair vs. replace options	F7. Replace hoses and fittings	F8. Order parts (read parts manual)
F9. Reassemble hydraulics	F10. Perform final adjustments						

Duties: G. OPERATE EQUIPMENT			
Tasks:			
G1. Read operator manual (view video)	G2. Follow safe operating procedures	G3. Start up and stop equipment	G4. Evaluate operating performance

Duties: H. WELDING		
Tasks:		
H1. Repair equipment	H2. Modify equipment	H3. Fabricate parts

Duties: I. RESTORE EQUIPMENT			
Tasks:			
I1. Install safety shields	I2. Prepare surface for painting	I3. Paint equipment	I4. Attach decals

Duties: J. SHOP MANAGEMENT						
Tasks:						
J1. Organize workplace	J2 . Maintain safe work environment	J3. Follow MSDS, OSHA and hazardous waste regulations	J4. Practice time management	J5. Complete paper work/ trail (P.O.s)	J6. Maintain service tools	J7. Maintain manuals (update)

Duties: K. CUSTOMER RELATIONS			
Tasks:			
K1. Maintain profes-sional demeanor	K2. Explain repairs to supervisors, dealer & customer	K3. Follow phone etiquette	K4. Follow golf etiquette

SKILL STANDARDS TEMPLATE A

Summary of Functions & Tasks for Turf Management Technician

Skills Standards Templates A & B For Turf Equipment Service Technician

Trained professional to provide high quality service for all types of golf course and commercial turf equipment.

Critical Work Function	Key Activity
A. Maintain Equipment	
	A1. Schedule service
	A2. Perform general and preventative maintenance service
	A3. Adjust equipment
	A4. Maintain service log
B. Maintain Reel/Rotary	
	B1. Sharpen and backlap reels and bed knives
	B2. Parallel rear roller to bed knife and check height
	B3. Adjust or replace bearings or reels
	B4. Sharpen and balance blade
C. Repair Systems	
	C1. Evaluate performance to diagnose possible problems
	C2. Install testing equipment
	C3. Tear down system
	C4. Evaluate repair vs. replace options
	C5. Order parts
	C6. Re-assemble system
	C7. Perform final adjustments
	C8. Weld equipment
	C9. Fabricate parts
D. Restore Equipment	
	D1. Restore equipment to original operating condition
	D2. Prepare surface for painting
	D3. Paint equipment
	D4. Attach decals
E. Manage the Shop	
	E1. Maintain organized workplace
	E2. Complete paperwork & document service
	E3. Maintain warranty information
	E4. Coordinate with co-workers
	E5. Dispose of hazardous materials

TURF EQUIPMENT SERVICE TECHNICIAN SKILL STANDARDS TEMPLATE B

Critical Work Function A: MAINTAIN EQUIPMENT

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
A1. Schedule Service	• Maintenance schedule follows factory recommended service schedules and accommodates environmental conditions. • Schedule effectively accommodates established priorities.	• Knowledge of environmental conditions that require more frequent service. • Ability to schedule service in a logical and efficient manner. • Knowledge of employer's needs, priorities and time schedules regarding business and equipment operation.	• Ability to follow rules, policies, and procedures. • Ability to apply self-management skills. • Ability to demonstrate commitment to customer. • Ability to follow instructions from references and/or supervisor.

Critical Work Function A: MAINTAIN EQUIPMENT

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
A2. Perform general and preventative maintenance service	• Maintenance is performed in a timely manner or immediately as required. • Equipment downtime is minimal. • Maintenance work is completed within specified time standard. • All service is safely performed according to operator's manual. • All potential problems are identified and a plan of action is determined. • Parts identified as needing replacement are ordered and safely installed. • General maintenance schedule is followed with preventative maintenance occurring as required.	• Knowledge of engine, power train, hydraulic, air quality, electrical, steering, and brake systems. • Ability to comprehend and follow manufacturer's reference materials. • Ability to visually inspect parts and recognize damage or wear. • Knowledge of safe and proper use of tools and materials. • Knowledge of proper application of lubricants for conditions. • Knowledge of warranty requirements regarding service.	• Ability to follow set of instructions. • Ability to perform a given set of tasks. • Ability to use materials in a safe and efficient manner. • Ability to communicate findings both orally and in written form. • Ability to complete record forms.
A3. Adjust equipment	• Equipment functions efficiently at optimal level for task. • Mowers produce a superior quality of cut at proper height of cut. • Adjustments ensure proper functional operation for longevity of equipment. • Adjustments are performed safely and according to manufacturer's guidelines.	• Knowledge of equipment and component operation and safety precautions. • Ability to visually identify quality of cut. • Ability to properly align cutting unit. • Ability to select proper measuring instrument to achieve accuracy.	• Ability to follow safety rules/policies. • Ability to understand requirements of the task and the technological results. • Ability to use logic to draw conclusions. • Ability to convert numerical data. • Ability to interpret and clarify information. • Ability to evaluate performance of technology • Ability to recognize details associated with system operation.

Critical Work Function A: MAINTAIN EQUIPMENT

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
A4. Maintain service log	• Maintenance logs are legible, easily accessible and up-to date. • Maintenance logs contains complete and detailed information including: parts lists, damage repair, labor hours, fuel costs, and identification of operator and technician.	• Knowledge of information required in a completed service log. • Knowledge of company procedures for service log.	• Ability to record information accurately. • Ability to maintain legible written records. • Ability to track task progress. • Ability to use computer. • Ability to demonstrate trustworthiness and accept responsibility for own behavior. • Ability to communicate in written form. • Ability to efficiently manage time.

Critical Work Function B: MAINTAIN REEL/ROTARY

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
B1. Sharpen and back-lap reels and bed knives	• Reel and bed knives achieve desired quality of cut. • Safety equipment/gear is utilized and all safety procedures are followed. • Reel and bed knives pass sharpness and shear test.	• Knowledge of safety equipment and procedures for sharpening equipment. • Knowledge of tempering. • Ability to achieve appropriate angles for optimum quality of cut and longevity of knives and/or blades. • Ability to utilize stones, grinders, compounds, and pneumatic facers to achieve proper cutting performance. • Knowledge of and ability to apply various sharpness and shear tests.	• Ability to follow safety rules/policies. • Ability to perform basic calculations. • Ability to convert numerical data. • Ability to utilize technological applications and follow proper procedures. • Ability to understand technological applications and operation. • Ability to apply appropriate principles/ laws/theories to situation.
B2. Parallel rear roller to bed knife and check height	• HOC bar achieves rear roller to bed knife parallel measurement. • Proper height of cut is achieved. • Measurement test is conducted safely.	• Ability to properly utilize HOC bar and squaring table to achieve trueness of cutting units. • Ability to identify when trueness is achieved. • Ability to use feeler gauges to measure tolerances. • Ability to calculate measurements or read *quick reference chart* to set height of cut. • Ability to select proper measuring device for task.	• Ability to perform basic calculations. • Ability to convert numerical data. • Ability to examine information. • Ability to interpret information. • Ability to recognize details associated with system operation. • Ability to apply appropriate principles/ laws/theories to situation.

Critical Work Function B: MAINTAIN REEL/ROTARY

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
B3. Adjust or replace bearings or reels	• Bearings roll smoothly with no play or dragging. • Bearings and seals are properly installed and lubricated.	• Knowledge of proper performance of bearing, race, and seal surfaces. • Ability to select and perform appropriate replacement of parts procedures. • Ability to use tools including: pullers, drivers, presses and removal devices.	• Ability to understand requirements of the task and the technological results. • Ability to select appropriate references, identify relevant specifications and follow set of instructions. • Ability to recognize details associated with system operation. • Ability to apply appropriate principles/ laws/theories to situation.
B4. Sharpen and balance blade	• Mower deck operates smoothly without vibration. • Safety equipment/gear is utilized and all safety procedures are followed. • Quality of cut is achieved. • Blade is sharpened to appropriate angle to maximize its life expectancy.	• Knowledge of safety equipment and procedures for sharpening equipment. • Knowledge of tempering. • Ability to achieve appropriate angles for optimum quality of cut and longevity of blades/ knives. • Ability to utilize stones and grinders to achieve optimum cutting performance. • Ability to perform a balance test on blade and correct as necessary. • Ability to recognize wear point.	• Ability to follow safety rules/policies. • Ability to use logic to draw conclusions. • Ability to perform basic calculations. • Ability to apply appropriate principles/ laws/theories to situation.

Critical Work Function C: REPAIR SYSTEMS - ENGINES, FUEL, HYDRAULIC POWER TRAINS, ELECTRICAL, HYDRAULICS, ELECTRONIC DIAGNOSTIC CENTER, COOLING, BRAKES, AND STEERING

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
C1. Evaluate performance to diagnose possible problems	• Operator is respectfully communicated with and complaint is clearly understood. • Operator comments and equipment operation are completely evaluated and possible causes of failure are determined. • The problem is accurately diagnosed in a timely manner.	• Knowledge of "normal" equipment operation and systems' fault indicators. • Knowledge of typical failure points.	• Ability to follow safety rules/policies. • Ability to identify symptoms. • Ability to examine information. • Ability to communicate well including: tact and diplomacy, prompting, clarifying and listening skills. • Ability to analyze possible causes/reasons. • Ability to use logic to draw conclusions.
C2. Install testing equipment	• Reference materials are consulted to accurately determine appropriate test equipment and procedure. • Test equipment is safely and properly installed.	• Knowledge of how test equipment operates. • Ability to safely install test equipment and interpret results.	• Ability to understand technological applications and operation. • Ability to follow safety rules/policies. • Ability to identify appropriate technology. • Ability to apply appropriate principles/ laws/theories to situation. • Ability to follow set of instructions.
C3. Tear down system	• Appropriate reference material for the repair is selected. • Appropriate equipment and tools for the job are used safely and effectively. • The problem is effectively assessed following established procedure for disassembly.	• Ability to locate required information within resource materials. • Knowledge of safe and proper use of tools and equipment. • Knowledge of proper procedure for disassembly of equipment and/or components.	• Ability to select appropriate references, identify relevant specifications and follow set of instructions. • Ability to follow written directions and comprehend reference materials. • Ability to understand requirements of the task and the technological results. • Ability to safely and effectively utilize equipment and tools.

Critical Work Function C: REPAIR SYSTEMS - ENGINES, FUEL, HYDRAULIC POWER TRAINS, ELECTRICAL, HYDRAULICS, ELECTRONIC DIAGNOSTIC CENTER, COOLING, BRAKES, AND STEERING

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
C4. Evaluate repair vs. replace options	• Appropriate precision measuring devices are selectively used to evaluate extent of wear or damage to components. • Repair options are completely discussed with supervisor and an appropriate course of action is recommended. • Total cost factors of various alternatives are analyzed.	• Knowledge of types and uses of precision measuring devises. • Ability to operate precision measuring devices. • Ability to compare measurements to specifications and draw conclusions. • Ability to visually inspect parts and recognize damage or wear. • Ability to obtain total cost factors of various alternatives.	• Ability to gather information. • Ability to perform basic calculations. • Ability to evaluate and compare alternatives. • Ability to recommend ethical course of action. • Ability to present information and actively participate in discussion. • Ability to demonstrate commitment to customer. • Ability to communicate conclusions and be open to other opinions.
C5. Order parts	• Machine and components needed for repairs are properly identified including serial numbers and model numbers. • Parts list is accurately created and the order is properly submitted. • All required paperwork is completed accurately and legibly.	• Ability to locate and identify components and their serial and model numbers. • Ability to read parts catalogs and identify correct parts for repair.	• Ability to recognize details associated with system operation. • Ability to accurately relay parts information to parts vendor via phone, fax, computer, etc. • Ability to record information and complete forms accurately. • Ability to follow policies/ procedures. • Ability to demonstrate honesty and trustworthiness. • Ability to perform data entry.

Critical Work Function C: REPAIR SYSTEMS - ENGINES, FUEL, HYDRAULIC POWER TRAINS, ELECTRICAL, HYDRAULICS, ELECTRONIC DIAGNOSTIC CENTER, COOLING, BRAKES, AND STEERING

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
C6. Reassemble system	• Machine is safely and correctly assembled and repaired to a condition consistent with manufacturer's specifications. • All fluids and filters are properly installed and machine is ready for operations. • Machine is cleaned consistent with employer's expectations.	• Ability to locate required information within resources. • Basic knowledge of engine, power train, hydraulic, air quality, electrical, steering, mowing and brake systems and their functions. • Ability to perform basic repair functions such as welding, cutting, and fabrication. • Knowledge of fluid types and their applications.	• Ability to follow instructions from references and/or supervisor. • Ability to convert numerical data. • Ability to apply self-management skills. • Ability to interpret and apply new knowledge and experiences. • Ability to troubleshoot system malfunctions.
C7. Perform final adjustments	• Equipment is safely operated and final adjustments are made to ensure equipment is operating consistent with manufacturer's guidelines. • Proper techniques are applied in making final adjustments. • Repairs are clearly explained to supervisors, dealer and "customer". • Explanation includes analysis of failure and actions taken to solve the problem.	• Knowledge of normal equipment operation and behavior. • Knowledge of, and/or ability to locate, required information related to tolerances, torques, and settings. • Ability to apply proper techniques in making final adjustments. • Ability to operate equipment and recognize when normal operation has been achieved. • Knowledge of technical terminology and industry jargon.	• Ability to monitor personal performance (workmanship) and accept responsibility. • Ability to evaluate performance of technology. • Ability to monitor system performance. • Ability to demonstrate commitment to customer. • Ability to follow safety and other rules/polices and procedures. • Ability to communicate complex information and participate in discussion. • Ability to collect and record information accurately. • Ability to recommend ethical course of action.

Critical Work Function C: PERFORM WELDING

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
C8. Weld equipment	• Appropriate welding equipment and techniques for the job are safely and effectively utilized. • Visual inspection of the weld indicates smooth and consistent bead.	• Ability to safely perform basic welding techniques including: gas torch, wire feed, stick rod, and grounding. • Ability to visually inspect weld for quality. • Knowledge of safety procedures involved in welding.	• Ability to follow safety rules/policies. • Ability to understand requirements of the task and the technological results. • Ability to identify appropriate technology. • Ability to extract information.
C9. Fabricate parts	• Appropriate fabrication equipment and techniques for the job are safely and effectively utilized. • Fabricated part does not affect normal operation of equipment. • No modification is made to equipment that adversely affects safety regulations.	• Ability to design and safely fabricate basic components. • Ability to recognize when fabrication may modify equipment operation or compromise safety features.	• Ability to perform basic calculations. • Ability to use logic to draw conclusions. • Ability to understand requirements of the task and the technological results.

Critical Work Function D: RESTORE EQUIPMENT

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
D1. Restore equipment to original operating condition	• Systems operation matches original specifications and design. • Equipment is safely restored following available manuals.	• Knowledge of parts terminology. • Ability to recognize all damaged or worn parts associated with failure. • Ability to create a complete and accurate list of parts. • Ability to locate required information within resources. • Basic knowledge of engine, power train, hydraulic, air quality, electrical , steering, mowing and brake systems and their functions. • Ability to perform basic repair functions such as welding, cutting, and fabrication.	• Ability to select appropriate references, identify relevant specifications and follow set of instructions. • Ability to use logic to draw conclusions. • Ability to evaluate and compare alternatives. • Ability to interpret information and analyze possible causes.
D2. Prepare surface for painting	• Surface is cleaned of all dirt and grease and is sanded down. • Product guidelines for surface preparation are followed. • Recommended safety procedures are followed.	• Ability to safely utilize chemicals and appropriate tools to prepare surface for painting. • Knowledge of safety apparatus required.	• Ability to follow safety rules/policies. • Ability to follow instructions from references and/or supervisor.

Critical Work Function D: RESTORE EQUIPMENT

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
D3. Paint equipment	• Recommended safety procedures are followed. • Painted surface has smooth, consistent finish.	• Knowledge of safety procedures, apparatus and equipment required for safe painting. • Knowledge of regulations governing painting procedures and disposal of hazardous materials. • Ability to apply painting techniques to achieve desired results.	• Ability to follow safety rules/policies. • Ability to follow instructions from references and/or supervisors. • Ability to handle materials in a safe and efficient manner. • Ability to understand requirements of the task and the technological results.
D4. Attach decals	• Decals are attached in the appropriate places and are properly positioned. • Decals are correctly applied.	• Knowledge of locations where decal attachment is required for operator safety/awareness. • Knowledge of decal application process.	• Ability to follow safety rules/policies. • Ability to follow technical manual guidelines. • Ability to follow written instructions regarding application and placement of decal.

Critical Work Function E: MANAGE SHOP

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills, Abilities, Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
E1. Maintain organized work place	• Workspace is clean, safe, and organized to supervisor's expectations. • Tools are maintained and easily accessible. • Service technical manuals are kept up-to-date and easily accessible.	• Knowledge of how to maintain a safe working environment. • Knowledge of supervisor's expectations. • Knowledge of special tool and shop equipment location.	• Ability to actively participate in team activities. • Ability to apply self-management skills. • Ability to monitor performance. • Ability to lead by example. • Ability to maintain materials in a safe and efficient manner.
E2. Complete paperwork and document service	• Purchase order paperwork is complete, legible and handled according to employer's procedures. • All fluids and shop supplies used for the repair and any disposal of hazardous wastes are properly accounted for. • All equipment service records are maintained and completed according to employer's procedure.	• Ability to maintain legible written records. • Ability to use computer if required. • Ability to communicate in written form. • Knowledge of information required in a complete service log. • Knowledge of information required in a complete work order.	• Ability to record information accurately and legibly. • Ability to identify and obtain data relevant to task. • Ability to perform data entry.
E3. Maintain warranty information	• Vendor is contacted and appropriate arrangements are determined and followed. • Warranty parts removed are properly tagged and stored. • All warranty paperwork is completely filled-out.	• Knowledge of information required for warranty process. • Knowledge of vendor contact procedures. • Knowledge of tagging and storing procedures for warranty parts.	• Ability to follow rules, policies and procedures. • Ability to communicate in oral and written form. • Ability to record information accurately and legibly. • Ability to identify and obtain data relevant to task. • Ability to follow established procedures.

Critical Work Function E: MANAGE SHOP

KEY ACTIVITY	PERFORMANCE INDICATORS *How do we know when the task is performed well?*	TECHNICAL KNOWLEDGE *Skills. Abilities. Tools*	EMPLOYABILITY SKILLS *Academic & SCANS Skills and Personal Qualities*
E4. Coordinate with co-workers	• Communication is delivered in a courteous and professional manner. • Information involving equipment operation and warranty process is accurately exchanged.	• Knowledge of information required for warranty process and shop management. • Knowledge of roles and responsibilities of co-workers and their requirements concerning information exchange.	• Ability to modify behavior to environment. • Knowledge of human relation skills. • Ability to lead by example. • Ability to communicate well including tact and diplomacy, prompting, clarifying and listening skills. • Ability to demonstrate honesty and trustworthiness. • Ability to actively participate in team activities.
E5. Dispose of hazardous materials	• All hazardous materials are safely stored and/or disposed of according to government regulations. • Storage and/or disposal containers are correctly labeled according to government regulations.	• Ability to identify all hazardous materials. • Knowledge of safe handling and disposal procedures for hazardous materials. • Ability to locate MSDS sheets, first aid kits and follow proper emergency procedures.	• Ability to follow set of instructions. • Ability to safely follow rules, policies and procedures.

TURF EQUIPMENT SERVICE TECHNICIAN SCENARIOS

The use of scenarios based on real life work situations provides a powerful contextual tool to assist the professional in this area of expertise in understanding and mastery of the necessary knowledge, skills, and abilities needed to work within this profession.

These three scenarios demonstrate how skill standards information can be directly applied to real workplace problems.

- **ROUTINE SCENARIO** – A typical situation that might occur during a typical day.

- **CRISIS SCENARIO** – A crisis situation that would challenge the individual to provide an appropriate and timely response.

- **LONG TERM PLANNING SCENARIO** – A long term planning situation.

For each scenario, relevant critical work functions and key activities involved in resolving the specific situations are identified. The key activities, knowledge skills and abilities necessary to approach and successfully resolve the specific work-related challenges may be referenced using the completed skill standards charts.

ROUTINE SCENARIO

The turf equipment service technician arrives at work and reviews the height of cut setting for the day. He adjusts the mowing machines accordingly and checks the reel to bed knife contact to assure quality of cut. The day is completed by checking maintenance logs and all machines are serviced as needed.

Primary Key Activities and Critical Work Functions Involved in this Scenario:

A. Maintain Equipment
- A1. Schedule service
- A2. Perform general and preventative maintenance service
- A3. Adjust equipment
- A4. Maintain service log

B. Maintain Reel / Rotary
- B1. Sharpen and backlap reels and bed knives
- B2. Parallel rear roller and bed knife and check height
- B3. Adjust or replace bearings or reels
- B4. Sharpen and balance blade

E. Restore Equipment
- E2. Prepare surface for painting
- E3. Paint equipment
- E4. Attach decals

F. Manage Shop
- F1. Maintain organized work place
- F2. Complete paperwork and document service
- F3. Maintain warranty information
- F4. Coordinate with co-workers
- F5. Dispose of hazardous materials

CRISIS SCENARIO

The turf equipment service technician is notified that a greens mower has blown a hydraulic hose on a green. He needs to remove the mower from the green in a timely fashion and clean up the oil spill which is on the green. The mower must be repaired as quickly as possible so that the mower can finish the job.

Primary Key Activities and Critical Work Functions Involved in this Scenario:

C. Repair Systems
- C1. Evaluate performance to diagnose possible problems
- C3. Tear down system
- C4. Evaluate repair vs. replace options
- C5. Order parts
- C6. Reassemble system
- C7. Perform final adjustments
- C8. Explain repairs to supervisors, dealer & customer

E. Restore Equipment
- E1. Restore equipment to original operating condition

F. Manage Shop
- F4. Coordinate with coworkers
- F5. Dispose of hazardous materials

LONG TERM PLANNING SCENARIO

The Superintendent announces an increase in the budget to purchase new equipment. The turf equipment service technician needs to price and prioritize a list of needed equipment that would make a normal workday more productive.

Primary Key Activities and Critical Work Functions Involved in this Scenario:

C. Repair systems
- C4. Evaluate repair vs. replace options
- C5. Order parts

F. Manage Shop
- F1. Maintain organized work place
- F4. Coordinate with co-workers

TURF EQUIPMENT SERVICE TECHNICIAN VALIDATION SURVEY RESULTS

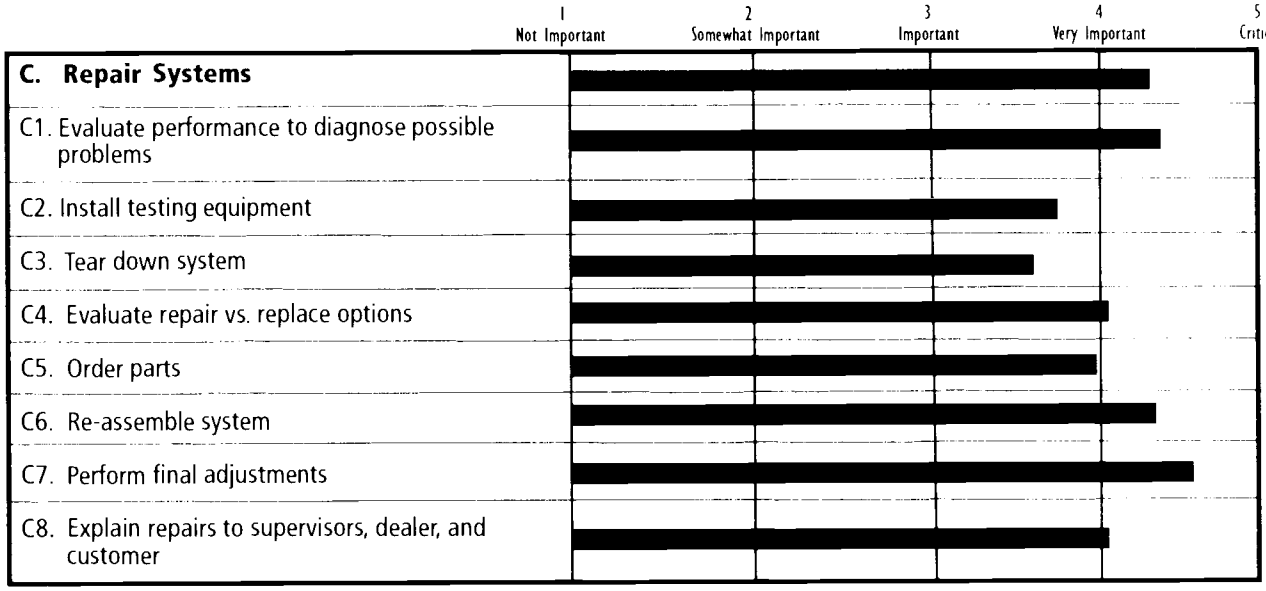
How important are these tasks in your position?

	1 Not Important	2 Somewhat Important	3 Important	4 Very Important	5 Critical
A. Maintain Equipment					
A1. Schedule service					
A2. Perform general and preventative maintenance service					
A3. Adjust equipment					
A4. Maintain service log					

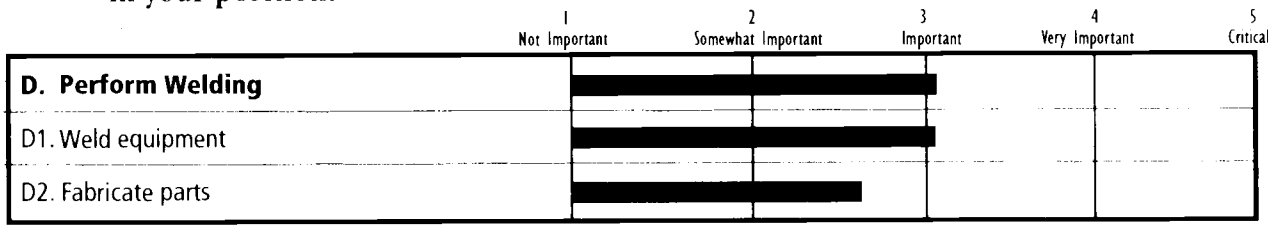
How important are these tasks in your position?

	1 Not Important	2 Somewhat Important	3 Important	4 Very Important	5 Critical
B. Maintain Reel/Rotary					
B1. Sharpen and backlap reels and bed knives					
B2. Parallel rear roller to bed knife and check height					
B3. Adjust or replace bearings or reels					
B4. Sharpen and balance blade					

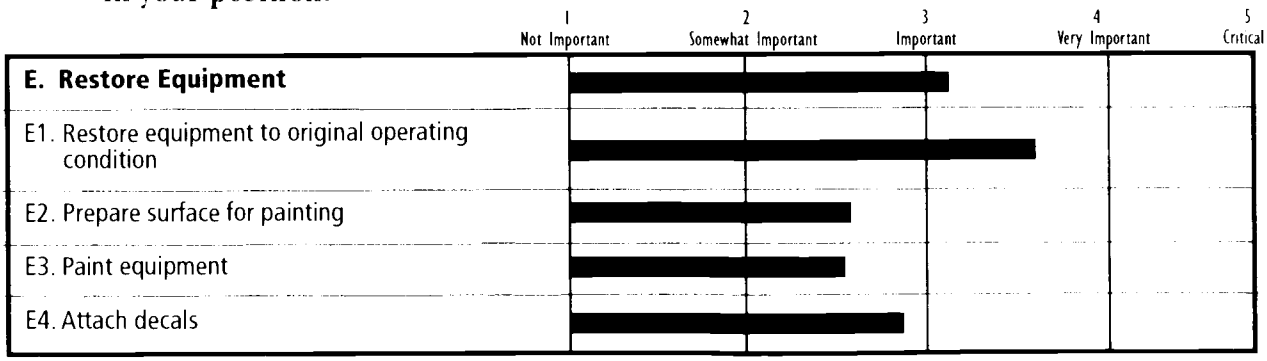
How important are these tasks in your position?



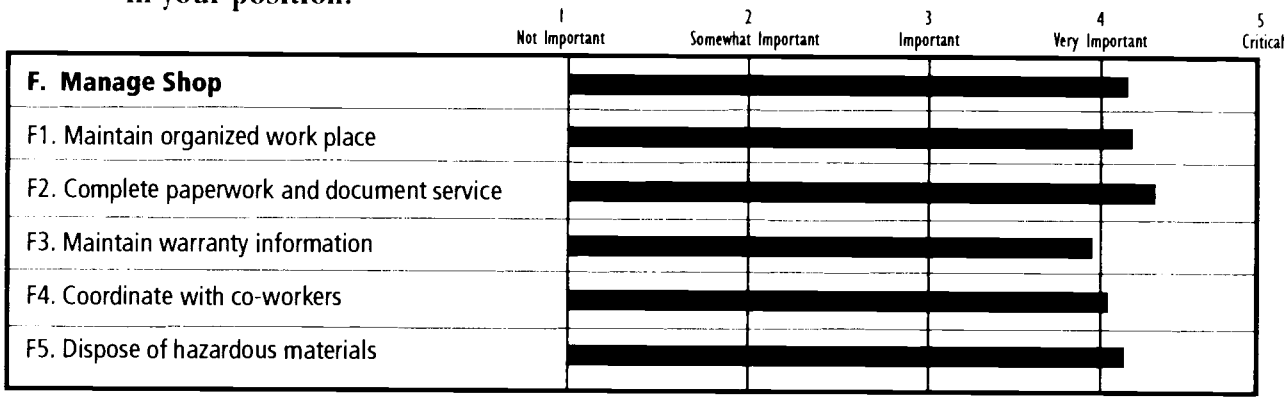
How important are these tasks in your position?



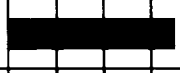
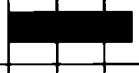
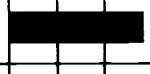
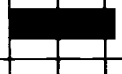
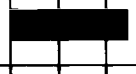
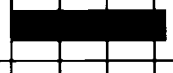
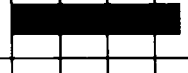
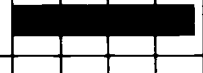
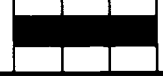
How important are these tasks in your position?

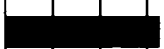


How important are these tasks in your position?



Turf Equipment Service Technician SCANS Skill Survey Results

Foundation Skills and Personal Qualities	0 1 2 3 4 5	Critical Competencies
Basic Skills		
Demonstrates Effective Reading Strategies		*Researches to gain knowledge and interprets, summarizes and analyzes information*
Demonstrates Effective Writing Strategies		*Writes simple documents for appropriate audience and purpose and summarizes information*
Applies Arithmetic Processes		*Performs measurements, interprets numerical data and predicts arithmetic results*
Applies Mathematics Processes		*Summarizes and translates mathematical data*
Demonstrates Effective Listening Skills		*Interprets, clarifies, and influences communication*
Demonstrates Effective Speaking Skills		*Presents basic ideas and explains concepts and actively participates in discussion*
Thinking Skills		
Applies Creative Thinking/ Generates Ideas		*Develops and applies creative solutions to new situations*
Applies Decision Making Strategies		*Analyzes situation and considers risks, implications, and multiple viewpoints and generates alternative solutions*
Recognizes and Solves Problems		*Examines situation, analyzes possible causes and generates solutions*
Demonstrates Visualization		*Visually analyzes relationship between parts/whole and process/ procedure*
Knows How to Learn		*Analyzes application, manipulates learning tools and investigates new learning techniques*
Applies Reasoning Skills		*Analyzes rules/principles and examines information for relevance and accuracy*

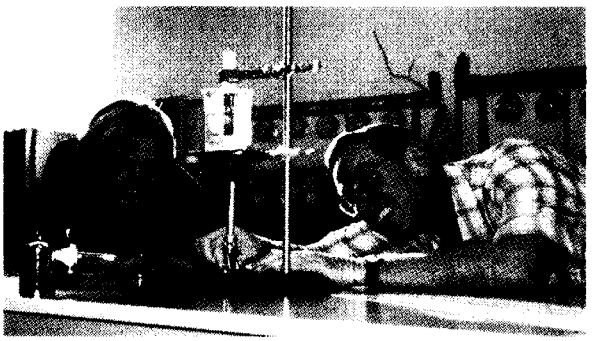
Foundation Skills and Personal Qualities	0 1 2 3 4 5	Critical Competencies
Personal Qualities		
Demonstrates Responsibility		*Monitors performance standards and follows through on assigned tasks*
Demonstrates Belief in Self Worth		*Accepts responsibility for own behavior, understands impact on others*
Demonstrates Sociability in Groups		*Modifies behavior to environment and shows empathy for others; encourages cooperation*
Demonstrates Self-Management		*Sets and adjusts goals, and demonstrates commitment to self improvement; maintains self control*
Demonstrates Integrity/Honesty		*Analyzes personal/societal implications of actions and formulates ethical course*
Management of Time and Resources		
Manages Time		*Prepares schedule and prioritizes, monitors, and adjusts task and manages timelines*
Manages Money		*Reconciles receipts and payments and performs routine record keeping*
Manages Materials/Facilities		*Orders and maintains inventory and monitors safe and efficient utilization of materials*
Manages Human Resources		*Anayzes and distributes work assignments and monitors performance*
Management and Use of Information		
Acquires/Evaluates Information		*Analyzes and integrates data and contrasts confliciting data*
Organizes/Maintains Information		*Interprets information and applies processes to new information*
Interprets/Communicates Information		*Interprets information, prepares basic summarizes and reports and selects methods of communication*
Uses Computers to Process Information		*Utilizes integrated software and retrieves stored information*

Turf Equipment Service Technician SCANS Skill Survey Results

Foundation Skills and Personal Qualities	0 1 2 3 4 5	Critical Competencies
Interpersonal Skills		
Participates as Team Member		*Demonstrates commitment, works to improve team skills activities and encourages team members*
Teaches Others		*Conducts task-specific training, coaches others and provides constructive feedback*
Serves Customers		*Analyzes customer needs, obtains additional resources to meet needs, makes exceptional effort on behalf of customer and resolves conflicts to customer's satisfaction*
Exhibits Leadership		*Leads by example, demonstates commitment to excellence and motivates others to extend their capabilities*
Negotiates Agreements		*Moderates discussion, demonstrates composure, interprets concerns and detects underlying issues*
Works with Diversity		*Demonstrates awareness and value of diversity*
Understanding and Management of Systems		
Understands System		*Understands the system/hierarchy, follows processes and procedures and anaylzes system configuration*
Monitors/Corrects System Performance		*Adjusts and monitors system operation and troubleshoots system malfunction*
Improves/Designs Systems		*Determines system components to be improved and suggests improvements*
Use of Technology		
Selects Appropriate Technology		*Analyzes task/technology relationship and proposes simple technological solutions*
Applies Technology to Task		*Analyzes task/technology relationship and analyzes technology output*
Maintains/Troubleshoots Technology		*Evaluates performance of technology and analyzes failures*

Appendix A / Resources

APPENDIX A RESOURCES



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Documents About Standards
http://inet.ed.gov/G2K/doc-stan.html

Gateway: Bioscience Industry Skill Standards
http://www.edc/org/CEEC/home/bioscibk.html

Goals 2000: Increasing Student Achievement through State and Local Initiatives
http://inet.ed.gov/G2K/Goals/Rpt/

Making Sense of Industry-Based Skill Standards
http://vocserve.berkeley.edu/summaries/777sum.html

National Skill Standards Board
http://wwwstc.cahwnet.gov/STWGLOSS/DEF32.htm

NCRVE'S Skill Standards Page
http://vocserve.berkeley.edu/SkillsPage.html

NHCSSP Part 1: Why Skill Standards?
http://www.fwl.org/nhcssp/nhcss01.htm

Net – The Occupational Information Network
http://www.doleta.gov/programs/onet/

SCANS 2000
http://www.jbv.edu:80/~ips/scans/

Sites Offering Academic and Skill Standards
http://inet.ed.gov/G2K/standard.html

SKANSLINK
http://www.dcccd.edu/nic/misc/scans/slink.htm

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